Physica Scripta., Vol 48, 297-325, 1993
ISSN (print): 1402-4896/48/3/008
doi; 10.1088/0031-8949/48/3/008

Transition Probabilities for Dipole Allowed Fine Structure Transitions in Si-like Ions: Si I, S III, Ar V and Ca VII

Sultana N. Nahar

Department of Astronomy, The Ohio State University, Columbus, OH 43210, U.S.A.

Abstract

Oscillator strengths and radiative transition probabilities for dipole allowed fine structure levels are obtained for Si-like ions: Si I, S III, Ar V and Ca VII from multiplet line strengths calculated for the Opacity Project and using the observed energy levels. The radiative calculations are carried out in the close-coupling approximation employing the R-matrix method as developed for the Opacity Project. There are relatively little previous data available for the transition probabilities of these ions. Comparisons of the present oscillator strengths with available experimental values exhibit good agreement in general.

1. Introduction

The Opacity Project has produced large quantities of accurate radiative data, energy levels, photoionization cross sections and oscillator strengths, for essentially all astrophysically abundant atoms and ions using *ab initio* methods based on the close coupling approximation and the R-matrix method [1]. Prior to the Opacity Project (hereafter OP), relatively few oscillator strengths were known for most of the elements and various ionization stages. The OP work therefore has resulted in making available huge amounts of radiative data. The OP calculations however have been carried out in the *LS* coupling approximation and the fine structures within the multiplet transitions are not considered. For the calculation of stellar opacities (the stated aim of the OP), this is a valid assumption in most regions of stellar plasmas as the fine structure is almost entirely subsumed by plasma broadening effects and a redistribution of oscillator strengths within the multiplets does not significantly affect the total opacities.

On the other hand for most other spectroscopic applications the transitions of interest are usually observed to be between individual fine structure levels and it is necessary to obtain the corresponding oscillator strengths. In a previous work on the Si-like ions [2] we have discussed the calculations and presented selected results for photoionization cross sections and *LS* multiplet f-values. In this paper we extend the OP work to calculate the fine structure f-values for the individual transitions within the multiplets through an algebraic transformation of the *LS* line strengths to fine structure components. In addition, the calculated f-values are obtained using observed energy levels and are thus an improvement over the original OP data that uses the calculated energies. Although the difference between the observed and the calculated energies is small in general, the f-values for closely spaced transitions can be significantly affected.

Detailed comparisons are made with available oscillator strengths from a variety of experimental (laser fluorescence, beam-foil etc.) sources.

In our OP calculations [2], we had considered all transitions between bound states up to $n \leq 10$ and $l \leq 5$ (i.e. all resulting *LS* multiplets). In the present work we report only a subset of the oscillator strengths data, derived from the earlier calculations, as the extent of the present work is constrained by the availability of the observed energy levels, since these are required for the recalculations of the fine structure f-values. Thus, although we consider a large number of transitions, a considerable body of the original OP data is stjll unprocessed.

As there is relatively little previous data, the present work is aimed at providing a comprehensive set of oscillator strengths for many practical laboratory and astrophysical applications.

2. Summary of theoretical work

The calculations for the *LS* oscillator strengths have been carried out in the close coupling (CC) approximation employing the R-matrix method. The CC expansion for the wavefunction of each ion consists of different sets of lowest states of the core ion such as 8-state CC expansion for Si I, 16-state CC expansion for S IV, 13-state *CC* expansion for Ar V, and 18-state CC expansion for Ca VII as given in Table I. More details about the spectroscopic and corre-

Table I. ***Ion core states in the CC expansion of the four elements of the Si-like ions; N is the number of states included***

Ion	*N*	States
Si II	8	$3s^23p(^2P^o)$, $3s3p^2(^4P, {}^2D)$, $3s^24s(^2S)$, $3s3p^2(^2S)$, $3s^23d(^2D)$, $3s^24p(^2P^o)$, $3s3p^2(^2P)$
S IV	16	$3s^23p(^2P^o)$, $3s3p^2(^4P)$, $3s3p^2(^2D)$, $3s3p^2(^2S)$, $3s3p^2(^2P)$, $3s^23d(^2D)$, $3s^24s(^2S)$, $3p^3(^2D^o)$, $3p^3(^4S^o)$, $3s3p3d(^4F^o)$, $3p^3(^2P^o)$, $3s^24p(^2P^o)$, $3s3p3d(^4F^o)$, $3s3p3d(^4D^o)$, $3s3p\,{}^3P^o3d(^2D^o)$, $3s3p\,{}^3P^o3d(^2F^o)$
Ar VI	13	$3s^23p(^2P^o)$, $3s3p^2(^4P)$, $3s3p^2(^2D)$, $3s3p^2(^2S)$, $3s3p^2(^2P)$, $3s^23d(^2D)$, $3p^3(^2D^o)$, $3p^3(^4S^o)$, $3s3p3d(^4F^o)$, $3p^3(^2P^o)$, $3s3p3d(^4P^o)$, $3s3p3d(^4D^o)$, $3s3p\,{}^3P^o3d(^2D^o)$
Ca VII	18	$3s^23p(^2P^o)$, $3s3p^2(^4P)$, $3s3p^2(^2D)$, $3s3p^2(^2S)$, $3s3p^2(^2P)$, $3s^23d(^2D)$, $3p^3(^2D^o)$, $3p^3(^4S^o)$, $3s3p3d(^4F^o)$, $3p^3(^2P^o)$, $3s3p3d(^4P^o)$, $3s3p3d(^4D^o)$, $3s3p^3P^o3d(^2D^o)$, $3s3p\,{}^3P^o3d(^2F^o)$, $3s3p\,{}^3P^o3d(^2P^o)$, $3s3p\,{}^1P^o3d(^2F^o)$, $3s3p\,{}^1P^o3d(^2D^o)$, $3s3p\,{}^1P^o3d(^2P^o)$

lation configurations and comparison of energy values can be found in Ref. [2]. The oscillator strength or the f-value for a bound-bound transition from state i to state f is given by

$$f_{if} = \frac{E_{fi}}{3g_i} S, \qquad (1)$$

where $E_{fi} = E_f - E_i$ is the transition energy, $g_i = (2S_i + 1)(2L_i + 1)$ is the statistical weight of the initial state in *LS* coupling or $g_i = (2J_i + 1)$ in fine structure, and S is the line strength (energies are in Rydberg unit throughout unless specified otherwise). In terms of dipole length and velocity operators

$$\mathbf{D_L} = \sum_n \mathbf{r}_n, \quad \mathbf{D_V} = -2 \sum_n \nabla_n, \qquad (2)$$

where the summation is over all atomic electrons, the line strength is given by

$$S_L = |\langle \psi_f \| \mathbf{D}_L \| \psi_i \rangle|^2, \quad (3a)$$

in the "length form" and

$$S_V = E_{fi}^{-2} |\langle \psi_f \| \mathbf{D}_V \| \psi_i \rangle|^2, \quad (3b)$$

in the "velocity form" respectively. For exact wave functions Ψ, $S_L = S_V$

The radiative transition probability, A_{fi} or the A-value, from a higher state f to a lower state i is related to oscillator strength f_{if} in atomic unit as

$$A_{fi}\ (\text{a.u.}) = \tfrac{1}{2}\alpha^3 \frac{g_i}{g_f} E_{fi}^2 f_{if}, \quad (4)$$

where α is the fine structure constant and g_f is the statistical weight of the final state; in c.g.s. unit of time A_{fi} is given by

$$A_{fi}\ (\text{sec}^{-1}) = \frac{A_{fi}\ (\text{a.u.})}{\tau_0}, \quad (5)$$

where $\tau_0 = 2.419 \times 10^{-17}$ sec is the atomic unit of time. The total radiative probability for the state f is

$$A_f = \sum_i A_{fi}, \quad (6)$$

and the lifetime of the state is obtained as

$$\tau_f = 1/A_f. \quad (7)$$

In the present work, the line strength *S* of a transition in *LS* multiplet is obtained from the oscillator strengths, using eq. (1), of the OP data for Si-like ions Si I, S III, Ar V and Ca VII and are split into fine structure transitions using standard algebraic transformation factors [3]. Correction to transition energies is now made by using observed energies to obtain the fine structure oscillator strengths and *A*-values. This improves the accuracy of the *f*-values since the spectroscopic energies are known to high precision. From large number of oscillator strengths in *LS* coupling obtained for the OP [2] such as 3149 values with 218 *LS* bound states of Si I, 3973 values with 236 bound states of S III, 7863 values with 342 bound states of Ar V and 16961 values with 497 bound states of Ca VII, with $n \leq 10$ and $l \leq 5$, we choose a small number of transitions for those states only that have been experimentally observed. Fine structure splitting is carried out for *f*-values calculated in length form only. The reason is that they are more accurate in the R-matrix calculations since the matrix elements for length form are weighted more towards the asymptotic region where the wave functions are better represented than the inner region [2].

3. Results

As the main aim of this presentation is to make available an extensive amount of transition probability data, derived from the OP, it is necessary to also ascertain the uncertainties in the theoretical calculations as compared with the most recent and reliable measurements in so far as possible. For the Si sequence there exist a few accurate sets of measurements by O'Brian and Lawler [4], Becker *et al.* [5], Berry *et al.* [6], Livingston *et al.* [7] and several others [8, 9]. In our

previous work [2], we have already compared the *LS* multiplet f-values from the OP calculations with available data. Whereas the present work is concerned with the more detailed fine structure transitions, in this section we compare the corresponding f-values with available experimental ones, primarily from sources cited above. We also compare the lifetimes of a number of excited states with the available measured values.

Table II presents the OP energy values of *LS* states along with the available observed values [10] for comparison. In accordance with the standard spectroscopic convention (e.g. in NIST tables) the table labels the energy order of states such that excited states of a particular $SL\pi$ with even parity are represented by ascending alphabets and with odd parity by descending alphabets. The same notation for energy order will be used later in Tables III, IV and V. It should be noted that all f-values and A -values in the present work for *LS* multiplet transitions, as well as for fine structure components, are obtained using observed spectroscopic energies. The calculated energies agree within 3% of observed values except some excited states of Si I, as discussed in Ref. [2]. From the point of view of observational spectroscopy this difference between the calculated and observed energies is significant. However, one might note that the OP calculations are the first *ab initio* calculations that obtain the spectroscopic data in a complete and self-consistent manner for an arbitrary large number of bound states of the atom or ion. As such, the number of transitions considered, even within the *LS* multiplet scheme, is very large. Nonetheless an obvious improvement over the OP results, implemented in the present work, is to employ the observed energies.

Detailed comparisons of the computed f-values with experimental measurements are presented in Table III. The first row lists the total *LS* multiplet transition, the corresponding oscillator strengths in the length and the velocity forms, and the experimental value. The fine structure f-values, obtained from the length form, are then compared individually with the experimental values. The calculated and measured A-values are also given for Si I. Si I experimental data are reported by O'Brian and Lawler [4], who have measured a number of transitions using laser-induced fluorescence technique which apparently has very low uncertainties, and by Becker *et al.* [5] who used beam-foil technique. The error bars for measured values of Si I by O'Brian and Lawler are approximate since they have been converted from $\pm\log_{10}(gf)$. Comparison of the present data with the measurements of O'Brian and Lawler [4] provides an accurate indicator of the overall uncertainties in the theoretical calculations. We find that the overall agreement between the two sets of data for the 26 fine structure transitions reported is within 5-10%, with the exception of some very weak transitions, e.g. $a^1D^e_2 - y^1P^o_1$ This is a general feature of most of the theoretical calculations, i.e. small f-values with $|f|1 < 0.01$, tend to involve significant amounts of calculation in the dipole matrix elements with resultant loss of accuracy in the final value. Agreement of the present f-values with the limited measured values by Becker *et al.* [5] is also good except for the same weak transition. We may thus estimate the uncertainty in the present f-values for Si I to be less than 10% for transitions with $|f\rangle > 0.01$.

For S III the available experimental data is much more sparse and from a number of different sources, all using

Table II. ***Comparison of calculated bound state energies of Si I, S III, Ar V and Ca VII***

State	Observed Values	Present Calculated Values	State	Observed Values	Present Calculated Values	State	Observed Values	Present Calculated Values
E (Ry): Si I								
$3p^2\ a^3P^e$	0.59855	0.6013	$3p5p\ b^3D^e$	7.964 (−2)	7.980 (−2)	$3p5f\ b^3G^e$	3.819 (−2).	4.026 (−2)
$^3p^2\ a^1D^e$	0.54252	0.5433	$3p5p\ c^3P^e$	7.683 (−2)	7.642 (−2)	$3p5f\ e^3D^e$	3.787 (−2).	3.993 (−2)
$3p^2\ a^1S^e$	0.45963	0.4543	$3p4d\ y^3F^o$	7.604 (−2)	7.749 (−2)	$3p7s\ t^3P^o$	3.680 (−2).	3.820 (−2)
$3s3p^3\ z^5S^o$	0.29623	0.3159	$3p5p\ b^3S^e$	7.556 (−2)	7.629 (−2)	$3p7s\ t^1P^o$	3.528 (−2).	3.731 (−2)
$3p4s\ z^3P^o$	0.23669	0.2376	$3p5p\ c^1D^e$	7.322 (−2)	7.282 (−2)	$3p6d\ s^3P^o$	3.521 (−2).	3.695 (−2)
$3p4s\ z^1P^o$	0.22637	0.2255	$3p5p\ c^1S^e$	6.854 (−2)	6.766 (−2)	$3p6d\ w^1D^o$	3.350 (−2)	3.430 (−2)
$3s3p^3\ z^3D^o$	0.18708	0.1981	$4p4d\ w^1P^o$	6.408 (−2)	6.422 (−2)	$3p6d\ u^3F^o$	3.094 (−2)	3.197 (−2)
$3p4p\ a^1P^e$	0.16903	0.1670	$3p4f\ a^1F^e$	6.360 (−2).	6.428 (−2)	$3p6d\ s^1P^o$	2.886 (−2)	2.840 (−2)
$3p3d\ z^1D^o$	0.16842	0.1764	$3p4f\ a^3F^e$	6.252 (−2).	6.425 (−2)	$3p6f\ c^3F^e$	2.811 (−2).	2.831 (−2)
$3p4p\ a^3D^e$	0.16104	0.1591	$3p4d\ y^1F^o$	6.324 (−2)	6.410 (−2)	$3p6d\ v^1F^o$	2.762 (−2)	2.820 (−2)
$3p4p\ b^3P^e$	0.15223	0.1478	$3p4d\ x^3D^o$	6.157 (−2)	6.297 (−2)	$3p6d\ v^3D^o$	2.691 (−2)	2.818 (−2)
$3p4p\ a^2S^e$	0.14976	0.1482	$3p4f\ a^3G^e$	6.115 (−2).	6.288 (−2)	$3p8s\ r^3P^o$	2.631 (−2).	2.671 (−2)
$3p3d\ z^3F^o$	0.14460	0.1504	$3p4f\ c^3D^e$	6.015 (−2).	6.244 (−2)	$3p8s\ r^1P^o$	2.390 (−2).	2.618 (−2)
$3p4p\ b^1D^e$	0.14256	0.1378	$3p4f\ d^1D^e$	6.053 (−2).	6.221 (−2)	$3p7d\ v^1D^o$	2.257 (−2)	2.443 (−2)
$3p3d\ y^3P^o$	0.13942	0.1454	$3p6s\ v^3P^o$	5.793 (−2).	5.916 (−2)	$3p7d\ s^3F^o$	2.233 (−2)	2.300 (−2)
$3p4p\ b^1S^e$	0.12960	0.1239	$3p6s\ v^1P^o$	5.574 (−2).	5.750 (−2)	$3p7d\ q^1P^o$	2.138 (−2)	2.081 (−2)
$3p3d\ z^1F^o$	0.11365	0.1170	$3p5d\ u^3P^o$	5.277 (−2).	5.462 (−2)	$3p7d\ s^1F^o$	1.997 (−2)	2.068 (−2)
$3p3d\ y^1P^o$	0.11342	0.1154	$3p5d\ x^1D^o$	5.042 (−2)	5.164 (−2)	$3p7d\ u^3D^o$	1.947 (−2)	2.071 (−2)
$3p3d\ y^3D^o$	0.10578	0.1093	$3p3d\ x^3F^o$	4.630 (−2)	4.743 (−2)	$3p9s\ p^1P^o$	1.703 (−2).	1.938 (−2)
$3p5s\ x^3P^o$	0.10396	0.1042	$3p5d\ u^1P^o$	4.126 (−2)	4.100 (−2)	$3p8d\ u^1D^o$	1.679 (−2)	1.829 (−2)
$3p5s\ x^1P^o$	9.990 (−2)	0.1005	$3p5f\ f^1D^e$	4.055 (−2).	3.991 (−2)	$3p8d\ q^3F^o$	1.666 (−2)	1.734 (−2)
$3p4d\ y^1D^o$	8.502 (−2)	8.640 (−2)	$3p5f\ b^3F^e$	4.053 (−2).	4.089 (−2)	$3p8d\ o^1P^o$	1.652 (−2)	1.590 (−2)
$3p4d\ w^3P^o$	8.324 (−2)	8.557 (−2)	$3p5d\ x^1F^o$	4.019 (−2)	4.075 (−2)	$3p8d\ q^1F^o$	1.500 (−2)	1.581 (−2)
$3p5p\ b^1P^e$	8.250 (−2)	8.228 (−2)	$3p5d\ w^3D^o$	3.931 (−2)	4.050 (−2)	$3p9d\ o^3F^o$	1.296 (−2)	1.354 (−2)
E (Ry): S III								
$3p^2\ a^3P^e$	2.57353	2.574	$3p4s\ x^3P^o$	1.23432	1.219	$3p4p\ b^1S^e$	0.90811	0.8996
$3p^2\ a^1D^e$	2.47035	2.469	$3p3d\ y^3D^o$	1.22768	1.209	$3p4d\ x^1D^o$	0.70409	0.6855
$3p^2\ a^1S^e$	2.32601	2.308	$3p4s\ y^1P^o$	1.22192	1.213	$3p4d\ y^3F^o$	0.70392	0.6891
$3s3p^3\ a^5S^o$	2.03887	2.071	$3p3d\ y^1D^o$	1.18860	1.156	$3p4d\ x^3D^o$	0.68941	0.6684
$3s3p^3\ z^3D^o$	1.80746	1.824	$3p3d\ z^1F^o$	1.13728	1.116	$3p4d\ w^3P^o$	0.67810	0.6610
$3s3p^3\ z^3P^o$	1.67360	1.674	$3p3d\ x^1P^o$	1.07777	1.030	$3p5s\ v^3P^o$	0.65678	0.6452
$3s3p^3\ z^1D^o$	1.62437	1.630	$3p4p\ a^1P^e$	1.04668	1.046	$3p4d\ y^1F^o$	0.64940	0.6291
$3p3d\ z^3F^o$	1.45718	1.454	$3p4p\ a^3D^e$	1.02199	1.021	$3p5s\ w^1P^o$	0.64776	0.6377
$3s3p^3\ z^1P^o$	1.32652	1.293	$3p4p\ b^3P^e$	0.99708	0.9961	$3p4d\ v^1P^o$	0.62759	0.6172
$3s3p^3\ z^5S^o$	1.31537	1.281	$3p4p\ a^3S^e$	0.98758	0.9864			
$3p3d\ y^3P^o$	1.26933	1.262	$3p4p\ b^1D^3$	0.96073	0.9573			
E (Ry): Ar V								
$3p^2\ a^3P^e$	5.51471	5.499	$3s3p^3\ z^1D^o$	4.10944	4.109	$3p3d\ z^1F^o$	3.27928	3.230
$3p^2\ a^1D^e$	5.36617	5.355	$3s3p^3\ z^3S^o$	3.76929	3.721	$3p3d\ y^1P^o$	3.21713	3.149
$3p^2\ a^1S^e$	5.16922	5.128	$3s3p^3\ z^1P^o$	3.73449	3.686	$3p4s\ x^3P^o$	2.80728	2.751
$3s3p^3\ z^3D^o$	4.40542	4.424	$3p3d\ y^3P^o$	3.52876	3.492	$3p4s\ x^1P^o$	2.76906	2.705
$3s3p^3\ z^3P^o$	4.22282	4.223	$3p3d\ y^3D^o$	3.46849	3.430			
E (Ry): Ca VII								
$3p^2\ a^3P^e$	9.38858	9.364	$3s3p^3\ z^1D^o$	7.55628	7.545	$3p3d\ z^1F^o$	6.45119	6.383
$3p^2\ a^1D^e$	9.21252	9.187	$3s3p^3\ ^3S^o$	7.17697	7.123	$3p3d\ y^1P^o$	6.37268	6.303
$3p^2\ a^1S^e$	8.96541	8.927	$3s3p^3\ z^1P^o$	7.11091	7.064	$3p4s\ x^1P^o$	4.86743	4.780
$3s3p^3\ z^3D^o$	7.95053	7.963	$3p3d\ y^3P^o$	6.79480	6.738	$3p4s\ x^3P^o$	4.92213	4.839
$3s3p^3\ z^3P^o$	7.72228	7.718	$3p3d\ y^3D^o$	6.71612	6.660			

The negative sign for the energy values has been omitted for convenience. Observed energies are from Martin and Zalubus (1983) and with "." at the end from the compilation by C. Moore (1949) for Si I, from Johansson *et al.* (1992) except $^5S^o$ which is from Martin *et al.* (1990) for S III, from Kelly (1987) for Ar V, and from Sugar and Corliss (1985) for Ca VII.

Table III. ***Comparison of the present oscillator strengths or the f-values, and transition probabilities A_{fi} in sec^{-1} with the observed values. f_L and f_v are the calculated oscillator strengths in length and velocity forms respectively***

Transition	Multiplet	g_i	g_f	WL (Å)	f_L Present	f_v Present	f Expt.	A_{fi} Present	A_{fi} Expt.
					Si I				
$3p^2$–$3p4s$	a^3P^e–z^3P^o	9	9		0.236	0.216	0.211[a]		
		5	5	2518.87	0.1767		0.1592 ± 0.008,[a] 0.155[b]	1.86 (8)	1.68 (8)[a]
		5	3	2531.32	0.0586		0.0520 ± 0.0027[a]	1.02 (8)	9.04 (7)[a]
		3	5	2509.65	0.0985		0.0859 ± 0.0043,[a] 0.098[b]	6.27 (7)	5.47 (7)[a]
		3	3	2522.00	0.0588		0.0522 ± 0.0026[a]	6.18 (7)	5.49 (7)[a]
		3	1	2526.89	0.0783		0.0708 ± 0.0034[a]	2.46 (8)	2.22 (8)[a]
		1	3	2517.11	0.2358		0.2104 ± 0.01[a]	8.29 (7)	7.40 (7)[a]
	a^1D^e–z^1P^o	5	3	2881.58	0.194	0.179	0.162 ± 0.008,[a] 0.170[b]		
	a^1S^e–z^1P^o	1	3	3905.52	0.103	0.087	0.091 ± 0.005,[a] 0.098[b]		
$3p^2$–$3p3d$	a^3P^e–y^3P^o	9	9		0.054	0.054	0.0513[a]		
		5	5	1990.59	0.0402		0.0390 ± 0.002[a]	6.78 (7)	6.57 (7)[a]
		5	3	1987.98	0.0134		0.0129 ± 0.0006[a]	3.78 (7)	3.65 (7)[a]
		3	5	1984.82	0.0224		0.0214 ± 0.001[a]	2.28 (7)	2.18 (7)[a]
		3	3	1982.23	0.0135		0.0122 ± 0.0006[a]	2.29 (7)	2.07 (7)[a]
		3	1	1980.81	0.0179		0.0170 ± 0.0008[a]	9.17 (7)	8.70 (7)[a]
		1	3	1979.21	0.0539		0.0491 ± 0.002[a]	3.06 (7)	2.79 (7)[a]
	a^1D^e–y^1P^o	5	3	2122.99	0.0056	0.0057	0.0029 ± 0.0005,[a] 0.0036[b]		
	a^1D^e–z^1D^o	5	5	2435.15	0.041	0.041	0.0394 ± 0.002[a]		
	a^1D^e–z^1F^o	5	7	2124.12	0.358	0.336	0.282 ± 0.015[a]		
	a^1S^e–y^1P^o	1	3	2631.28	0.409	0.409	0.330 ± 0.017,[a] 0.355[b]		
$3p^2$–$3s3p^3$	a^3P^e–z^3D^o	9	15		0.052	0.053	0.056[a]		
		5	7	2219.16	0.0437		0.0469 ± 0.0023[a]	4.23 (7)	4.54 (7)[a]
		5	5	2220.51	7.79 (−3)		8.05 (−3) ± 0.4 (−3)[a]	1.06 (7)	1.09 (7)[a]
		5	3	2221.38	5.19 (−4)		4.63 (−4) ± 0.6 (−4)[a]	1.17 (6)	1.05 (6)[a]
		3	5	2213.34	0.0391		0.0422 ± 0.002[a]	3.20 (7)	3.45 (7)[a]
		3	3	2214.20	0.0130		0.0134 ± 0.0007[a]	1.77 (7)	1.81 (7)[a]
		1	3	2210.43	0.0522		0.0575 ± 0.003[a]	2.38 (7)	2.62 (7)[a]
					S III				
Transition	Multiplet	g_i	g_f		f_L Present	f_v Present	f Expt.		
$3p^2$–$3s3p^3$	a^3P^e–z^3D^o	9	15		0.0246	0.0217	0.022 ± 0.002,[a] 0.022[b]		
	a^3P^e–z^3P^o	9	9		0.0425	0.0374	0.036[b]		
	a^1D^e–z^1D^o	15	15		0.0216	0.0194	0.0167 ± 0.005,[a] 0.99 ± 0.10[c]		
$3p^2$–$3p3d$	a^3P^e–y^3D^o	9	15		1.637	1.604	0.96 ± 0.19[d]		
$3p4p$–$3p4d$	a^3D^e–y^3F^o	15	21		0.908	0.844	0.685 ± 0.05[a]		
$3p^2$–$3p4s$	a^1D^e–y^1P^o	15	9		0.0930	0.0930	0.07 ± 0.04[d]		
	a^1S^e–y^1P^o	1	9		0.0662	0.0630	0.08 ± 0.05[d]		
					Ar V				
Transition	Multiplet	g_i	g_f		f_L Present	f_v Present	f Expt.		
$3p^2$–$3s3p^3$	a^3P^e–z^3P^o	9	9		0.061	0.059	0.057 ± 0.002[a]		

(continued)

beam-foil technique. The reported measurements are for *LS* mulitplet transitions between a few triplet and singlet states as given in Table III. The computed f-value for the transition a^3P^e-z^3D° is in very good agreement with both the Berry *et al.* [6] and Livingston *et al.* [7], nearly within experimental uncertainties. For the transition a^1D^e-z^1D°, present results are in closer agreement with the Berry *et al.* value than with Irwin *et al.* [8]. However, for the a^3P^e-y^3D° transition our results differ considerably with the value reported by Ryan *et al.* [9]. For the remaining

transitions

Table III. ***(continued)***

				Ca VII		
				f_L	f_V	
Transition	Multiplet	g_i	g_f	Present		f (EB)
$3p^2$–$3s3p^3$	a^3P^e–z^3P^o	9	9	0.0680	0.0648	0.064
		5	5	0.0507		0.0502
		5	3	0.0169		0.0135
		3	5	0.0285		0.0210
		3	3	0.0171		0.0210
		3	1	0.0228		0.0220
		1	3	0.0691		0.0631
	a^1D^e–z^1P^o	5	3	0.247	0.243	0.236
	a^1D^e–z^1D^o	5	5	0.0889	0.0853	0.096
	a^1S^e–z^1P^o	1	3	0.174	0.165	0.191
$3p^2$–$3s3d$	a^1D^e–z^1F^o	5	7	0.959	0.959	0.896
$3p^2$–$3p4s$	a^1D^e–x^1P^o	5	3	0.139	0.135	0.133
	a^1S^e–x^1P^o	1	3	0.114	0.108	0.120

Si I: [a] O'Brian and Lawler (1991); [b] Becker *et al.* (1980).
S III: [a] Berry *et al.* (1970); [b] Livingston *et al.* (1976); [c] Irwin *et al.* (1973); [d] Ryan *et al.* (1989).
Ar V: [a] Irwin *et al.* (1973).
Ca VII: EB, Biemont (1986).

we find differences with the earlier beam-foil results at about 10-20% level; however, the number of comparisons is too few to ascertain any definite limit on the uncertainties in the S III calculations.

For Ar V, there is only one available measurement for the a^3P^e-$z^3P°$ transition and the present f-value is in good agreement with it. To our knowledge, there are no experimental measurements for Ca VII. As discussed in Ref. [2], oscillator strengths for these two ions are expected to have good accuracy since they have low discrepancy (about 5%) between the length and the velocity forms for most of the transitions. In Ref. [2], we carried out detailed comparisons of the oscillator strengths for these four ions with available theoretical works. Earlier detailed calculations include six-state close coupling calculations of Mendoza and Zeippen [11] for a few transitions in Si I, atomic structure calculations by Ho and Henry [12] also for a limited transition in S III. Both works correspond to *LS* multiplet oscillator strengths. There seem to be no theoretical calculations for Ar V oscillator strengths. Atomic structure calculations for fine structure oscillator strengths in Ca VII was carried out by Biemont [13] for a number of transitions. Comparison of the present results with his values for some transitions are made in Table III and both calculated values agree well with each other.

In addition to direct comparison of calculated oscillator, strengths with the experimental values, another indicator of the overall uncertainties may be obtained by considering the lifetimes of excited states, as the calculations of lifetimes involves a number of transitions through which the given state may undergo radiative decay. Table IV presents and compares calculated lifetimes of a number of excited states for which measured values are available. These lifetimes are obtained from the sum, eq. (7), of radiative transition probabilities, or the *A*-values, of the dipole allowed states given in Table V. Notation for states are the same as Table II. The quoted experimental uncertainties are given within parentheses next to the values. Measured lifetimes for a set of fine
structure levels are available mainly for Si I [4, 14], with which we compare our results. The

present calculated values for Si I are in fair agreement with the laser excitation and time resolved detection measurement by Bergstrom *et al.* [14], the difference between the calculated and measured values ranging from 2% for $b^3D^e_3$ to 28% for $c^3P^e_1$. The agreement between the calculated and measured values using laser-induced fluorescence method by O'Brian and Lawler [4] is good in general except for some levels such as $u^lP^o_1$, $w^3P^o_{2,1,0}$, $y^1D^\circ_2$, $y^3D^\circ_{1,2,3}$ The difference is large especially for $u^1P^o_1$, $w^3P^\circ_{2,1,0}$. As can be seen from Table V that the lifetime contributions to $u^1P^o_1$ come from radiative decay to dipole allowed states a^1S^e, b^1s^e c^1s^e, a^1P^e, b^1P^e, a^1d^e, b^1D^e, c^lD^e, d^1D^e and e^1D^e. The number of routes of radiative decay is limited in this work by the number of observed energy levels. It could be possible that inclusion of contributions from higher excited states such as of' $^1S^e$, $^1P^e$ would have increased the total transition probability and hence reduce the lifetime. The forbidden transitions usually have very small contributions to the total transition probablity. The opposite is the case for $w^3P^\circ_{2,1,0}$ levels where the calculated lifetimes are much shorter than those measured by O'Brian and Lawler. For w^3P° states, the dominant contributions come from decay to levels of the terms a^3S^e, a^3P^e and b^3P^e, resulting in a large total transition probability and smaller lifetime for each w^3P° level. The reason for this difference is not very obvious from the present calculations since the calculated oscillator strengths from transitions among the above levels do not have a large discrepancy between the length and the velocity forms.

For S III and Ar V, lifetimes are given for *LS* excited states. S III lifetimes have been measured by beam-foil technique by various investigators. Present values for lifetime compares well with Berry *et al.* [6], Livingston *et al.* [7], Dumont *et al.* [15] and Irwin and Livingston [16]. The calculated lifetime of Ar V states agree well with those measured by Livingston *et al.* [17] except for states y^3P°, z^1F°. Calculated lifetime agree well with the single measurement

Table IV. ***Comparison of lifetimes, τ (ns), of excited states of Si I, S III and Ar V***

State	τ (ns) Cal.	Obs.	State	τ (ns) Cal.	Obs.	State	τ (ns) Cal.	Obs.
Si I								
$b^3S_1^e$	167.6	180[a]	$x^3P_0^o$	13.7	13.8 (0.7)[b]	$z^3D_2^o$	23.5	22.0 (1.1)[b]
$z^1P_1^o$	3.64	4.3 (0.2)[b]	$x^3P_1^o$	13.6	12.6 (0.6)[b]	$z^3D_3^o$	23.6	22.0 (1.1)[b]
$y^1P_1^o$	6.64	8.5 (0.4)[b]	$x^3P_2^o$	13.4	13.4 (0.7)[b]	$y^3D_1^o$	3.06	4.2 (0.2)[b]
$x^1P_1^o$	8.69	8.8 (0.4)[b]	$w^3P_2^o$	23.5	37.2 (1.9)[b]	$y^3D_2^o$	3.07	4.0 (0.2)[b]
$w^1P_1^o$	15.7	10.8 (0.5)[b]	$w^3P_1^o$	23.3	32.4 (1.6)[b]	$y^3D_3^o$	3.09	4.1 (0.2)[b]
$u^1P_1^o$	29.6	13.4 (0.7)[b]	$w^3P_0^o$	23.1	31.9 (1.6)[b]	$x^3D_3^o$	4.58	4.8 (0.3)[b]
$c^3P_0^e$	125.7	148[a]	$u^3P_2^o$	11.6	1.1 (0.6)[b]	$x^3D_2^o$	4.57	4.8 (0.3)[b]
$c^3P_1^e$	127.1	168[a]	$u^3P_1^o$	11.5	11.7 (0.6)[b]	$x^3D_1^o$	4.55	5.7 (0.3)[b]
$c^3P_2^e$	122.6	152[a]	$u^3P_0^o$	11.4	12.1 (0.6)[b]	$w^3D_3^o$	7.69	8.5 (0.4)[b]
$z^3P_0^o$	4.07	4.5 (0.2)[b]	$z^1D_2^o$	21.5	22.4 (1.1)[b]	$w^3D_2^o$	7.67	8.1 (0.4)[b]
$z^3P_1^o$	4.06	4.5 (0.2)[b]	$y^1D_2^o$	36.6	44.5 (2.2)[b]	$w^3D_1^o$	7.67	16.1 (0.8)[b]
$z^3P_2^o$	4.02	4.5 (0.2)[b]	$b^3D_3^e$	253.2	266[a]	$z^1F_3^o$	2.61	3.3 (0.2)[b]
$y^3P_2^o$	11.0	11.4 (0.6)[b]	$b^3D_2^e$	262.0	253[a]	$y^1F_3^o$	6.02	6.2 (0.3)[b]
$y^3P_1^o$	10.9	11.5 (0.6)[b]	$b^3D_1^e$	255.4	260[a]	$x^1F_3^o$	11.3	10.2 (0.5)[b]
$y^3P_0^o$	10.9	11.7 (0.6)[b]	$z^3D_1^o$	23.4	22.0 (1.1)[b]	$v^1F_3^o$	18.9	19.2 (1.0)[b]
S III								
a^3S^e	1.83	2.05 (0.1)[a]	x^3P^o	0.813	1.1 (0.1)[a]	z^1P^o	0.154	0.18 (0.02)[d]
b^3P^e	2.10	2.0 (0.1)[a]	z^3D^o	14.6	16 (1.0)[b], 15.9 (0.5)[a]	z^1D^o	8.07	10.4 (0.3)[a]
z^3P^o	3.66	4.4 (0.4)[b]	y^3D^o	0.070	0.11 (0.02),[c] 0.12 (0.03)[d]	a^3D^e	2.01	2.58 (0.2)[a]
y^3P^o	0.096	0.12 (0.02)[c]						
Ar V								
z^1P^o	0.094	0.12 (0.02)[a]	y^3P^o	0.056	0.13 (0.02)[a]	z^1F^o	0.034	0.06 (0.02)[a]
z^3P^o	1.25	1.20 (0.1),[a] 1.33 (0.05)[b]	z^3D^o	0.036	0.03 (0.01)[a]			

Si I: [a] Bergstrom *et al.* (1989); [b] O'Brian and Lawler (1991).
S III: [a] Berry *et al.* (1970); [b] Livingston *et al.* (1976); [c] Dumont *et al.* (1978); [d] Irwin and Livingston (1974).
Ar V: [a] Livingston *et al.* (1981); [b] Irwin *et al.* (1973).

by Irwin *et al.* [8] also. The main point with respect to the lifetimes is that the present calculations yield a fairly complete set of oscillator strength data which, in turn, can be used to obtain lifetimes for a large number of states with uncertainties as indicated by the detailed comparisons in Table III. Even though agreement of the present calculated values of radiative lifetime of excited states varies in comparison with different measurements, the present calculations have been carried out in a theoretically and computationally-consistent manner for a large number of transitions.

Finally, we present all calculated dipole oscillator strengths (f_{if}), line strengths (S) and transition probabilities (A_{fi} in sec^{-1}) of the Si-like ions, Si I, S III, Ar V, and Ca VII in Tables Va, b, c, and d respectively. Each table lists the transitions among singlet states first, and then those among triplet states. The *f*-, *S*-, and *A*-values are presented for both the *LS* multiplet and fine structure transitions. For a triplet-to-triplet transition, the first line corresponds to the transition in *LS* multiplet and the following lines to its fine structure components. Conservation of total *LS* multiplet line strength with the sum of fine structure components is checked for each *LS* transition and the discrepancy is always found to be less than 0.01%.

The notation for the states in Table V are the same as described for Table II. *"g"* is the statistical weight factor of the initial or final state. Energies of initial and final states, and the transition energy between them are given for the fine structure transitions in the table. While the energy of each fine structure level is given in Rydberg units, the transition energy between the levels is given in terms of wavelength (λ). However, for transitions in *LS* coupling for the triplet states only transition energy in Rydberg is given between columns E_i and E_f. It should be noted that the transition energies in terms of wavelengths may have uncertainties by a few Angstrom

units. The observed energies [10] used for f_{if} and A_{fi} values of the present work were obtained in units of cm^{-1}, from the compilation of NIST. The transition wavelength in Å units is then obtained from the reciprocal of the transition energy in cm^{-1}, thus introducing some numerical inaccuracy in λ from the format of the energies written.

4. Conclusion

The Opacity Project calculations for *LS* multiplets have been extended, using observed wavelengths, to calculate radiative transition probabilities for a large number of fine structure transitions. The present report provides an extensive set of data that compares well with the variety of available experimental measurements and is generally of high accuracy, with typical uncertainties of about 10%. The data is expected to be useful in several astrophysical and laboratory applications.

Acknowledgements

The author would like to thank Professor Anil K. Pradhan for suggesting the work and comments. The work was carried out on the Cray Y-MP at the Ohio Supercomputer Center in Columbus, Ohio. A fellowship award by the College of Mathematical and Physical Sciences at the Ohio State University is gratefully acknowledged.

Table V(a). ***f- and A-values for Si I***

Si I

Transition	E_i (Ry)	E_f (Ry)	WL (Å)	g_i	g_f	f_{if}	S	a_{ji} (sec^{-1})
$a^1S^e \rightarrow z^1P^o$	0.1403	0.3735	3907	1	3	1.0297 (−1)	1.3243	1.5002 (7)
$a^1S^e \rightarrow y^1P^o$	0.1403	0.4865	2632	1	3	4.1783 (−1)	3.6205	1.3410 (8)
$a^1S^e \rightarrow x^1P^o$	0.1403	0.5000	2533	1	3	5.6025 (−2)	4.6721 (−1)	1.9412 (7)
$a^1S^e \rightarrow w^1P^o$	0.1403	0.5358	2304	1	3	1.2067 (−1)	9.1515 (−1)	5.0550 (7)
$a^1S^e \rightarrow v^1P^o$	0.1403	0.5434	2260	1	3	2.3572 (−2)	1.7540 (−1)	1.0259 (7)
$a^1S^e \rightarrow u^1P^o$	0.1403	0.5587	2178	1	3	5.3145 (−2)	3.8108 (−1)	2.4907 (7)
$a^1S^e \rightarrow t^1P^o$	0.1403	0.5639	2151	1	3	1.1683 (−2)	8.2734 (−2)	5.6135 (6)
$a^1S^e \rightarrow s^1P^o$	0.1403	0.5711	2115	1	3	2.8119 (−2)	1.9582 (−1)	1.3971 (7)
$a^1S^e \rightarrow r^1P^o$	0.1403	0.5753	2095	1	3	6.6354 (−3)	4.5760 (−2)	3.3619 (6)
$a^1S^e \rightarrow q^1P^o$	0.1403	0.5785	2079	1	3	1.6681 (−2)	1.1419 (−1)	8.5784 (6)
$a^1S^e \rightarrow p^1P^o$	0.1403	0.5822	2062	1	3	4.1252 (−3)	2.8006 (−2)	2.1566 (6)
$a^1S^e \rightarrow o^1P^o$	0.1403	0.5834	2057	1	3	1.0714 (−2)	7.2536 (−2)	5.6327 (6)
$b^1S^e \rightarrow y^1P^o$	0.4703	0.4865	56328	1	3	5.0824 (−1)	9.4235 (1)	3.5624 (5)
$b^1S^e \rightarrow x^1P^o$	0.4703	0.5000	30684	1	3	6.1304 (−2)	6.1923	1.4478 (5)
$b^1S^e \rightarrow w^1P^o$	0.4703	0.5358	13909	1	3	3.9729 (−1)	1.8191 (1)	4.5664 (6)
$b^1S^e \rightarrow v^1P^o$	0.4703	0.5434	12462	1	3	2.4670 (−2)	1.0120	3.5325 (5)
$b^1S^e \rightarrow u^1P^o$	0.4703	0.5587	10316	1	3	1.1082 (−1)	3.7636	2.3156 (6)
$b^1S^e \rightarrow t^1P^o$	0.4703	0.5639	9738	1	3	9.4347 (−3)	3.0242 (−1)	2.2126 (5)
$b^1S^e \rightarrow s^1P^o$	0.4703	0.5711	9046	1	3	4.7047 (−2)	1.4010	1.2784 (6)
$b^1S^e \rightarrow r^1P^o$	0.4703	0.5753	8682	1	3	4.6844 (−3)	1.3388 (−1)	1.3820 (5)
$b^1S^e \rightarrow q^1P^o$	0.4703	0.5785	8421	1	3	2.4667 (−2)	6.8380 (−1)	7.7348 (5)
$b^1S^e \rightarrow p^1P^o$	0.4703	0.5822	8148	1	3	2.7077 (−3)	7.2632 (−2)	9.0680 (4)
$b^1S^e \rightarrow o^1P^o$	0.4703	0.5834	8059	1	3	1.4763 (−2)	3.9167 (−1)	5.0544 (5)
$c^1S^e \rightarrow w^1P^o$	0.5314	0.5358	204136	1	3	5.7088 (−1)	3.8400 (2)	3.0404 (4)
$c^1S^e \rightarrow v^1P^o$	0.5314	0.5434	75490	1	3	7.3367 (−2)	1.8235 (1)	2.8617 (4)
$c^1S^e \rightarrow u^1P^o$	0.5314	0.5587	33400	1	3	3.7497 (−1)	4.1236 (1)	7.4714 (5)
$c^1S^e \rightarrow t^1P^o$	0.5314	0.5639	28012	1	3	1.7870 (−2)	1.6480	5.0630 (4)
$c^1S^e \rightarrow s^1P^o$	0.5314	0.5711	22964	1	3	1.1207 (−1)	8.4733	4.7246 (5)
$c^1S^e \rightarrow r^1P^o$	0.5314	0.5753	20751	1	3	7.2266 (−3)	4.9373 (−1)	3.7306 (4)
$c^1S^e \rightarrow q^1P^o$	0.5314	0.5785	19323	1	3	5.0478 (−2)	3.2111	3.0059 (5)
$c^1S^e \rightarrow p^1P^o$	0.5314	0.5822	17943	1	3	3.7743 (−3)	2.2298 (−1)	2.6058 (4)
$c^1S^e \rightarrow o^1P^o$	0.5314	0.5834	17517	1	3	2.7818 (−2)	1.6042	2.0155 (5)
$a^1P^e \rightarrow y^1P^o$	0.4309	0.4865	16385	3	3	6.8986 (−2)	1.1163 (1)	1.7142 (6)
$a^1P^e \rightarrow x^1P^o$	0.4309	0.5000	13180	3	3	3.0705 (−1)	3.9969 (1)	1.1790 (7)
$a^1P^e \rightarrow w^1P^o$	0.4309	0.5358	8682	3	3	7.6236 (−3)	6.5370 (−1)	6.7460 (5)
$a^1P^e \rightarrow v^1P^o$	0.4309	0.5434	8096	3	3	3.2828 (−2)	2.6246	3.3414 (6)
$a^1P^e \rightarrow u^1P^o$	0.4309	0.5587	7132	3	3	5.5101 (−3)	3.8809 (−1)	7.2263 (5)
$a^1P^e \rightarrow t^1P^o$	0.4309	0.5639	6851	3	3	1.0120 (−2)	6.8466 (−1)	1.4385 (6)
$a^1P^e \rightarrow s^1P^o$	0.4309	0.5711	6501	3	3	3.2837 (−3)	2.1082 (−1)	5.1829 (5)
$a^1P^e \rightarrow r^1P^o$	0.4309	0.5753	6311	3	3	4.7179 (−3)	2.9403 (−1)	7.9028 (5)
$a^1P^e \rightarrow q^1P^o$	0.4309	0.5785	6172	3	3	2.0637 (−3)	1.2578 (−1)	3.6142 (5)
$a^1P^e \rightarrow p^1P^o$	0.4309	0.5822	6024	3	3	2.6580 (−3)	1.5813 (−1)	4.8859 (5)
$a^1P^e \rightarrow o^1P^o$	0.4309	0.5834	5975	3	3	1.3761 (−3)	8.1203 (−2)	2.5712 (5)
$a^1P^e \rightarrow y^1D^o$	0.4309	0.5149	10847	3	5	5.5249 (−1)	5.9181 (1)	1.8796 (7)
$a^1P^e \rightarrow x^1D^o$	0.4309	0.5495	7682	3	5	8.8400 (−2)	6.7071	5.9945 (6)
$a^1P^e \rightarrow w^1D^o$	0.4309	0.5664	6724	3	5	2.8870 (−2)	1.9171	2.5557 (6)
$a^1P^e \rightarrow v^1D^o$	0.4309	0.5773	6222	3	5	1.3421 (−2)	8.2471 (−1)	1.3874 (6)
$a^1P^e \rightarrow u^1D^o$	0.4309	0.5831	5986	3	5	7.4060 (−3)	4.3779 (−1)	8.2734 (5)
$b^1P^e \rightarrow w^1P^o$	0.5174	0.5358	49478	3	3	9.2270 (−2)	4.5083 (1)	2.5146 (5)
$b^1P^e \rightarrow v^1P^o$	0.5174	0.5434	35015	3	3	4.8982 (−1)	1.6936 (2)	2.6657 (6)
$b^1P^e \rightarrow u^1P^o$	0.5174	0.5587	22098	3	3	1.9372 (−3)	4.2276 (−1)	2.6463 (4)
$b^1P^e \rightarrow t^1P^o$	0.5174	0.5639	19604	3	3	5.3033 (−2)	1.0267 (1)	9.2066 (5)
$b^1P^e \rightarrow s^1P^o$	0.5174	0.5711	16990	3	3	2.2424 (−3)	3.7625 (−1)	5.1824 (4)
$b^1P^e \rightarrow r^1P^o$	0.5174	0.5753	15748	3	3	1.7570 (−2)	2.7326	4.7263 (5)
$b^1P^e \rightarrow q^1P^o$	0.5174	0.5785	14911	3	3	1.6001 (−3)	2.3561 (−1)	4.8011 (4)
$b^1P^e \rightarrow p^1P^o$	0.5174	0.5822	14076	3	3	8.3369 (−3)	1.1590	2.8067 (5)
$b^1P^e \rightarrow o^1P^o$	0.5174	0.5834	13812	3	3	1.1129 (−3)	1.5181 (−1)	3.8916 (4)
$b^1P^e \rightarrow x^1D^o$	0.5174	0.5495	28406	3	5	6.5832 (−1)	1.8469 (2)	3.2651 (6)
$b^1P^e \rightarrow w^1D^o$	0.5174	0.5664	18600	3	5	1.1771 (−1)	2.1624 (1)	1.3615 (6)
$b^1P^e \rightarrow v^1D^o$	0.5174	0.5773	15207	3	5	4.4500 (−2)	6.6839	7.7000 (5)
$b^1P^e \rightarrow u^1D^o$	0.5174	0.5831	13869	3	5	2.1903 (−2)	3.0000	4.5578 (5)
$z^1P^o \rightarrow b^1S^e$	0.3735	0.4703	9416	3	1	9.1753 (−2)	8.5334	2.0704 (7)
$z^1P^o \rightarrow c^1S^e$	0.3735	0.5314	5774	3	1	9.5018 (−3)	5.4183 (−1)	5.7035 (6)
$z^1P^o \rightarrow a^1P^e$	0.3735	0.4309	15893	3	3	3.5280 (−1)	5.5385 (1)	9.3138 (6)
$z^1P^o \rightarrow b^1P^e$	0.3735	0.5174	6334	3	3	6.4970 (−4)	4.0643 (−2)	1.0802 (5)
$z^1P^o \rightarrow b^1D^e$	0.3735	0.4574	10873	3	5	6.4984 (−1)	6.9783 (1)	2.1998 (7)

continued

Table V(a). ***(continued)***

Si I

Transition	E_i (Ry)	E_f (Ry)	WL (Å)	g_i	g_f	f_{if}	S	a_{ji} (sec^{-1})
$z^1P^o \rightarrow c^1D^e$	0.3735	0.5267	5950	3	5	3.3396 (−2)	1.9627	3.7745 (6)
$z^1P^o \rightarrow d^1D^e$	0.3735	0.5387	5519	3	5	3.1310 (−3)	1.7067 (−1)	4.1136 (5)
$z^1P^o \rightarrow e^1D^e$	0.3735	0.5586	4923	3	5	8.2376 (−3)	4.0055 (−1)	1.3600 (6)
$y^1P^o \rightarrow c^1S^e$	0.4865	0.5314	20307	3	1	4.0771 (−2)	8.1760	1.9789 (6)
$y^1P^o \rightarrow b^1P^e$	0.4865	0.5175	29472	3	3	1.1552 (−4)	3.3626 (−2)	8.8714 (2)
$y^1P^o \rightarrow c^1D^e$	0.4865	0.5267	22672	3	5	9.2770 (−2)	2.0775 (1)	7.2216 (5)
$y^1P^o \rightarrow d^1D^e$	0.4865	0.5387	17472	3	5	8.1051 (−1)	1.3985 (2)	1.0627 (7)
$y^1P^o \rightarrow e^1D^e$	0.4865	0.5586	12633	3	5	1.5166 (−2)	1.8920	3.8037 (5)
$x^1P^o \rightarrow c^1S^e$	0.5000	0.5314	29064	3	1	8.2543 (−2)	2.3689 (1)	1.9561 (6)
$x^1P^o \rightarrow b^1P^e$	0.5000	0.5174	52373	3	3	5.4495 (−1)	2.8172 (2)	1.3252 (6)
$x^1P^o \rightarrow c^1D^e$	0.5000	0.5267	34164	3	5	7.6062 (−1)	2.5668 (2)	2.6074 (6)
$x^1P^o \rightarrow d^1D^e$	0.5000	0.5387	23586	3	5	1.2813 (−1)	2.9843 (1)	9.2194 (5)
$x^1P^o \rightarrow e^1D^e$	0.5000	0.5586	15547	3	5	4.1544 (−2)	6.3783	6.8800 (5)
$w^1P^o \rightarrow d^1D^e$	0.5358	0.5387	323226	3	5	1.3066 (−1)	4.1700 (2)	5.0076 (3)
$w^1P^o \rightarrow e^1D^e$	0.5358	0.5586	39972	3	5	1.8920 (−1)	7.4686 (1)	4.7401 (5)
$v^1P^o \rightarrow e^1D^e$	0.5434	0.5586	59990	3	5	1.1423	6.7680 (2)	1.2702 (6)
$a^1D^e \rightarrow z^1P^o$	0.0574	0.3735	2882	5	3	1.9399 (−1)	9.2039	2.5957 (8)
$a^1D^e \rightarrow y^1P^o$	0.0574	0.4865	2124	5	3	5.6157 (−3)	1.9631 (−1)	1.3842 (7)
$a^1D^e \rightarrow x^1P^o$	0.0574	0.5000	2059	5	3	2.9588 (−2)	1.0027	7.7601 (7)
$a^1D^e \rightarrow w^1P^o$	0.0574	0.5358	1905	5	3	2.4167 (−3)	7.5767 (−2)	7.4056 (6)
$a^1D^e \rightarrow v^1P^o$	0.0574	0.5434	1875	5	3	1.1126 (−2)	3.4335 (−1)	3.5187 (7)
$a^1D^e \rightarrow u^1P^o$	0.0574	0.5587	1818	5	3	1.4490 (−3)	4.3361 (−2)	4.8739 (6)
$a^1D^e \rightarrow t^1P^o$	0.0574	0.5639	1799	5	3	5.4455 (−3)	1.6126 (−1)	1.8703 (7)
$a^1D^e \rightarrow s^1P^o$	0.0574	0.5711	1774	5	3	9.0182 (−4)	2.6335 (−2)	3.1854 (6)
$a^1D^e \rightarrow r^1P^o$	0.0574	0.5753	1760	5	3	3.1248 (−3)	9.0505 (−2)	1.1220 (7)
$a^1D^e \rightarrow q^1P^o$	0.0574	0.5785	1749	5	3	5.9445 (−4)	1.7110 (−2)	2.1613 (6)
$a^1D^e \rightarrow p^1P^o$	0.0574	0.5822	1737	5	3	1.9572 (−3)	5.5946 (−2)	7.2152 (6)
$a^1D^e \rightarrow o^1P^o$	0.0574	0.5834	1732	5	3	4.1091 (−4)	1.1718 (−2)	1.5220 (6)
$a^1D^e \rightarrow z^1D^o$	0.0574	0.4315	2436	5	5	4.1397 (−2)	1.6599	4.6535 (7)
$a^1D^e \rightarrow y^1D^o$	0.0574	0.5149	1992	5	5	2.4432 (−3)	8.0105 (−2)	4.1075 (6)
$a^1D^e \rightarrow x^1D^o$	0.0574	0.5495	1852	5	5	4.4436 (−3)	1.3545 (−1)	8.6434 (6)
$a^1D^e \rightarrow w^1D^o$	0.0574	0.5664	1790	5	5	3.6801 (−3)	1.0845 (−1)	7.6586 (6)
$a^1D^e \rightarrow v^1D^o$	0.0574	0.5773	1753	5	5	2.7655 (−3)	7.9784 (−2)	6.0052 (6)
$a^1D^e \rightarrow u^1D^o$	0.0574	0.5831	1733	5	5	2.0428 (−3)	5.8286 (−2)	4.5352 (6)
$a^1D^e \rightarrow z^1F^o$	0.0574	0.4863	2125	5	7	3.6016 (−1)	1.2597 (1)	3.8006 (8)
$a^1D^e \rightarrow y^1F^o$	0.0574	0.5367	1901	5	7	1.2162 (−1)	3.8063	1.6029 (8)
$a^1D^e \rightarrow x^1F^o$	0.0574	0.5597	1814	5	7	5.8569 (−2)	1.7489	8.4792 (7)
$a^1D^e \rightarrow v^1F^o$	0.0574	0.5723	1770	5	7	3.2987 (−2)	9.6098 (−1)	5.0177 (7)
$a^1D^e \rightarrow t^1F^o$	0.0574	0.5800	1744	5	7	2.0398 (−2)	5.8553 (−1)	3.1956 (7)
$a^1D^e \rightarrow r^1F^o$	0.0574	0.5849	1727	5	7	1.3441 (−2)	3.8218 (−1)	2.1459 (7)
$b^1D^e \rightarrow y^1P^o$	0.4574	0.4865	31270	5	3	5.2556 (−2)	2.7054 (1)	5.9743 (5)
$b^1D^e \rightarrow x^1P^o$	0.4574	0.5000	21360	5	3	2.4933 (−1)	8.7668 (1)	6.0743 (6)
$b^1D^e \rightarrow w^1P^o$	0.4574	0.5358	11612	5	3	1.2924 (−3)	2.4701 (−1)	1.0656 (5)
$b^1D^e \rightarrow v^1P^o$	0.4574	0.5434	10585	5	3	1.6896 (−2)	2.9440	1.6764 (6)
$b^1D^e \rightarrow u^1P^o$	0.4574	0.5587	8996	5	3	6.8440 (−4)	1.0134 (−1)	9.4019 (4)
$b^1D^e \rightarrow t^1P^o$	0.4574	0.5639	8553	5	3	5.1314 (−3)	7.2239 (−1)	7.7988 (5)
$b^1D^e \rightarrow s^1P^o$	0.4574	0.5711	8015	5	3	3.5544 (−4)	4.6892 (−2)	6.1514 (4)
$b^1D^e \rightarrow r^1P^o$	0.4574	0.5753	7727	5	3	2.4093 (−3)	3.0645 (−1)	4.4857 (5)
$b^1D^e \rightarrow q^1P^o$	0.4574	0.5785	7520	5	3	2.0549 (−4)	2.5436 (−2)	4.0396 (4)
$b^1D^e \rightarrow p^1P^o$	0.4574	0.5822	7302	5	3	1.3661 (−3)	1.6419 (−1)	2.8483 (5)
$b^1D^e \rightarrow o^1P^o$	0.4574	0.5834	7230	5	3	1.2987 (−4)	1.5455 (−2)	2.7618 (4)
$b^1D^e \rightarrow y^1D^o$	0.4574	0.5149	15838	5	5	1.6702 (−1)	4.3541 (1)	4.4417 (6)
$b^1D^e \rightarrow x^1D^o$	0.4574	0.5495	9890	5	5	8.3161 (−3)	1.3538	5.6709 (5)
$b^1D^e \rightarrow w^1D^o$	0.4574	0.5664	8356	5	5	1.4645 (−3)	2.0145 (−1)	1.3989 (5)
$b^1D^e \rightarrow v^1D^o$	0.4574	0.5773	7595	5	5	4.4860 (−4)	5.6085 (−2)	5.1870 (4)
$b^1D^e \rightarrow u^1D^o$	0.4574	0.5831	7246	5	5	1.8250 (−4)	2.1766 (−2)	2.3187 (4)
$b^1D^e \rightarrow z^1F^o$	0.4574	0.4863	31517	5	7	4.9481 (−1)	2.5673 (2)	2.3727 (6)
$b^1D^e \rightarrow y^1F^o$	0.4574	0.5367	11489	5	7	1.4766 (−1)	2.7924 (1)	5.3302 (6)
$b^1D^e \rightarrow x^1F^o$	0.4574	0.5597	8902	5	7	5.6931 (−2)	8.3419	3.4230 (6)
$b^1D^e \rightarrow v^1F^o$	0.4574	0.5723	7928	5	7	2.7477 (−2)	3.5858	2.0826 (6)
$b^1D^e \rightarrow t^1F^o$	0.4574	0.5800	7434	5	7	1.5515 (−2)	1.8984	1.3377 (6)
$b^1D^e \rightarrow r^1F^o$	0.4574	0.5849	7144	5	7	9.6820 (−3)	1.1385	9.0386 (5)
$c^1D^e \rightarrow w^1P^o$	0.5267	0.5358	99655	5	3	8.2988 (−2)	1.3605 (2)	9.3013 (4)
$c^1D^e \rightarrow v^1P^o$	0.5267	0.5434	54399	5	3	3.5054 (−1)	3.1373 (2)	1.3182 (6)
$c^1D^e \rightarrow u^1P^o$	0.5267	0.5587	28510	5	3	8.9476 (−4)	4.1981 (−1)	1.2243 (4)
$c^1D^e \rightarrow t^1P^o$	0.5267	0.5639	24489	5	3	2.0927 (−2)	8.4338	3.8810 (5)
$c^1D^e \rightarrow s^1P^o$	0.5267	0.5711	20542	5	3	5.0166 (−4)	1.6959 (−1)	1.3221 (4)
$c^1D^e \rightarrow r^1P^o$	0.5267	0.5753	18753	5	3	6.5912 (−3)	2.0343	2.0841 (5)

Table V(a). ***(continued)***

Transition	Si I E_i (Ry)	E_f (Ry)	WL (Å)	g_i	g_f	f_{if}	S	a_{ji} (sec^{-1})
$c^1D^e \rightarrow q^1P^o$	0.5267	0.5785	17578	5	3	2.7919 (−4)	8.0769 (−2)	1.0048 (4)
$c^1D^e \rightarrow p^1P^o$	0.5267	0.5822	16429	5	3	3.1163 (−3)	8.4270 (−1)	1.2836 (5)
$c^1D^e \rightarrow o^1P^o$	0.5267	0.5834	16071	5	3	1.7162 (−4)	4.5395 (−2)	7.3890 (3)
$c^1D^e \rightarrow x^1D^o$	0.5267	0.5495	39955	5	5	2.0959 (−1)	1.3783 (2)	8.7592 (5)
$c^1D^e \rightarrow w^1D^o$	0.5267	0.5664	22942	5	5	1.5475 (−2)	5.8442	1.9611 (5)
$c^1D^e \rightarrow v^1D^o$	0.5267	0.5773	17992	5	5	4.0813 (−3)	1.2087	8.4100 (4)
$c^1D^e \rightarrow u^1D^o$	0.5267	0.5831	16148	5	5	1.6217 (−3)	4.3101 (−1)	4.1495 (4)
$c^1D^e \rightarrow y^1F^o$	0.5267	0.5367	91297	5	7	7.3719 (−1)	1.1069 (3)	4.2211 (5)
$c^1D^e \rightarrow x^1F^o$	0.5267	0.5597	27585	5	7	9.0989 (−2)	4.1308 (1)	5.6987 (5)
$c^1D^e \rightarrow v^1F^o$	0.5267	0.5723	19981	5	7	4.0497 (−2)	1.3318 (1)	4.8334 (5)
$c^1D^e \rightarrow t^1F^o$	0.5267	0.5800	17112	5	7	2.1263 (−2)	5.9885	3.4605 (5)
$c^1D^e \rightarrow r^1F^o$	0.5267	0.5849	15650	5	7	1.2770 (−2)	3.2895	2.4842 (5)
$d^1D^e \rightarrow v^1P^o$	0.5387	0.5434	190320	5	3	1.6123 (−2)	5.0489 (1)	4.9522 (3)
$d^1D^e \rightarrow u^1P^o$	0.5387	0.5587	45563	5	3	1.2679 (−2)	9.5094	6.7895 (4)
$d^1D^e \rightarrow t^1P^o$	0.5387	0.5639	36093	5	3	6.3886 (−7)	3.7952 (−4)	5.4527
$d^1D^e \rightarrow s^1P^o$	0.5387	0.5711	28127	5	3	2.1664 (−3)	1.0030	3.0445 (4)
$d^1D^e \rightarrow r^1P^o$	0.5387	0.5753	24878	5	3	1.3411 (−6)	5.4917 (−4)	2.4088 (1)
$d^1D^e \rightarrow q^1P^o$	0.5387	0.5785	22852	5	3	7.6870 (−4)	2.8913 (−1)	1.6366 (4)
$d^1D^e \rightarrow p^1P^o$	0.5387	0.5822	20947	5	3	1.3294 (−6)	4.5841 (−4)	3.3676 (1)
$d^1D^e \rightarrow o^1P^o$	0.5387	0.5834	20369	5	3	3.7299 (−4)	1.2505 (−1)	9.9949 (3)
$d^1D^e \rightarrow x^1D^o$	0.5387	0.5495	84037	5	5	3.2111 (−2)	4.4434 (1)	3.0307 (4)
$d^1D^e \rightarrow w^1D^o$	0.5387	0.5664	32831	5	5	1.1199 (−3)	6.0538 (−1)	6.9272 (3)
$d^1D^e \rightarrow v^1D^o$	0.5387	0.5773	23555	5	5	3.0494 (−4)	1.1825 (−1)	3.6645 (3)
$d^1D^e \rightarrow u^1D^o$	0.5387	0.5831	20493	5	5	1.2926 (−4)	4.3599 (−2)	2.0532 (3)
$d^1D^e \rightarrow x^1F^o$	0.5387	0.5597	43247	5	7	4.7040 (−3)	3.3488	1.1981 (4)
$d^1D^e \rightarrow v^1F^o$	0.5387	0.5723	27086	5	7	8.5287 (−5)	3.8029 (−2)	5.5374 (2)
$d^1D^e \rightarrow t^1F^o$	0.5387	0.5800	22071	5	7	1.1700 (−5)	4.2506 (−3)	1.1445 (2)
$d^1D^e \rightarrow r^1F^o$	0.5387	0.5849	19697	5	7	3.8085 (−6)	1.2349 (−3)	4.6760 (1)
$e^1D^e \rightarrow u^1P^o$	0.5586	0.5587	41841004	5	3	5.4600 (−4)	4.0950 (2)	2.9237 (−3)
$e^1D^e \rightarrow t^1P^o$	0.5586	0.5639	172945	5	3	2.8745 (−1)	8.1818 (2)	1.0687 (5)
$e^1D^e \rightarrow s^1P^o$	0.5586	0.5711	73369	5	3	7.9757 (−4)	9.6325 (−1)	1.6470 (3)
$e^1D^e \rightarrow r^1P^o$	0.5586	0.5753	54725	5	3	2.1964 (−2)	1.9787 (1)	8.1512 (4)
$e^1D^e \rightarrow q^1P^o$	0.5586	0.5785	45795	5	3	4.7530 (−4)	3.5826 (−1)	2.5197 (3)
$e^1D^e \rightarrow p^1P^o$	0.5586	0.5822	38735	5	3	7.1111 (−3)	4.5352	5.2662 (4)
$e^1D^e \rightarrow o^1P^o$	0.5586	0.5834	36803	5	3	2.7398 (−4)	1.6598 (−1)	2.2485 (3)
$e^1D^e \rightarrow w^1D^o$	0.5586	0.5664	117160	5	5	1.6411 (−1)	3.1682 (2)	7.9584 (4)
$e^1D^e \rightarrow v^1D^o$	0.5586	0.5773	48710	5	5	1.8518 (−2)	1.4854 (1)	5.2015 (4)
$e^1D^e \rightarrow u^1D^o$	0.5586	0.5831	37211	5	5	5.4116 (−3)	3.3146	2.6070 (4)
$e^1D^e \rightarrow x^1F^o$	0.5586	0.5597	833681	5	7	2.1749 (−1)	2.9930 (3)	1.4825 (3)
$e^1D^e \rightarrow v^1F^o$	0.5586	0.5723	66685	5	7	5.4640 (−2)	6.0000 (1)	5.8495 (4)
$e^1D^e \rightarrow t^1F^o$	0.5586	0.5800	42763	5	7	2.8589 (−2)	2.0123 (1)	7.4485 (4)
$e^1D^e \rightarrow r^1F^o$	0.5586	0.5849	34668	5	7	1.6200 (−2)	9.2466	6.4191 (4)
$z^1D^o \rightarrow b^1P^e$	0.4315	0.5174	10606	5	3	6.8298 (−4)	1.1923 (−1)	6.7496 (4)
$z^1D^o \rightarrow b^1D^e$	0.4315	0.4574	35238	5	5	2.4788 (−2)	1.4378 (1)	1.3315 (5)
$z^1D^o \rightarrow c^1D^e$	0.4315	0.5267	9573	5	5	2.2971 (−3)	3.6197 (−1)	1.6718 (5)
$z^1D^o \rightarrow d^1D^e$	0.4315	0.5387	8504	5	5	2.2708 (−2)	3.1786	2.0945 (6)
$z^1D^o \rightarrow e^1D^e$	0.4315	0.5586	7168	5	5	1.0372 (−3)	1.2237 (−1)	1.3467 (5)
$y^1D^o \rightarrow b^1P^e$	0.5149	0.5174	360905	5	3	4.8802 (−2)	2.9049 (2)	4.1488 (3)
$y^1D^o \rightarrow c^1D^e$	0.5149	0.5267	77236	5	5	5.7390 (−2)	7.3015 (1)	6.4076 (4)
$y^1D^o \rightarrow d^1D^e$	0.5149	0.5387	38350	5	5	1.1743 (−1)	7.4132 (1)	5.3247 (5)
$y^1D^o \rightarrow e^1D^e$	0.5149	0.5586	20834	5	5	2.1553 (−3)	7.3913 (−1)	3.3121 (4)
$x^1D^o \rightarrow e^1D^e$	0.5495	0.5586	99759	5	5	1.3987 (−1)	2.2955 (2)	9.3854 (4)
$z^1F^o \rightarrow c^1D^e$	0.4863	0.5267	22544	7	5	6.3752 (−2)	3.3122 (1)	1.1713 (6)
$z^1F^o \rightarrow d^1D^e$	0.4863	0.5387	17395	7	5	1.7619 (−3)	7.0622 (−1)	5.4379 (4)
$z^1F^o \rightarrow e^1D^e$	0.4863	0.5586	12593	7	5	1.0999 (−2)	3.1917	6.4781 (5)
$y^1F^o \rightarrow d^1D^e$	0.5367	0.5387	459749	7	5	8.3815 (−5)	8.8895 (−1)	3.6950
$y^1F^o \rightarrow e^1D^e$	0.5367	0.5586	41496	7	5	1.8396 (−1)	1.7592 (2)	9.9758 (5)
$a^3S^e \rightarrow y^3P^o$	1.0332 (−2)			3	9	9.2615 (−2)	8.0679 (1)	2.6468 (4)
	0.4502	0.4602	90895	3	5	4.9951 (−2)	4.4821 (1)	2.4218 (4)
	0.4502	0.4608	85710	3	3	3.1763 (−2)	2.6893 (1)	2.8829 (4)
	0.4502	0.4611	83141	3	1	1.0917 (−2)	8.9643	3.1598 (4)
$a^3S^e \rightarrow x^3P^o$	4.5797 (−2)			3	9	2.2933 (−1)	4.5067 (1)	1.2878 (6)
	0.4502	0.4969	19499	3	5	1.3003 (−1)	2.5037 (1)	1.3690 (6)
	0.4502	0.4949	20349	3	3	7.4745 (−2)	1.5022 (1)	1.2039 (6)
	0.4502	0.4943	20638	3	1	2.4570 (−2)	5.0075	1.1546 (6)

continued

Table V(a). ***(continued)***

Transition	Si I E_i (Ry)	E_f (Ry)	WL (Å)	g_i	g_f	f_{if}	S	a_{ji} (sec^{-1})
$a^3S^e \rightarrow w^3P^o$	6.6514 (−2)			3	9	7.8273 (−1)	1.0591 (2)	9.2716 (6)
	0.4502	0.5166	13715	3	5	4.3443 (−1)	5.8839 (1)	9.2448 (6)
	0.4502	0.5167	13698	3	3	2.6097 (−1)	3.5304 (1)	9.2783 (6)
	0.4502	0.5170	13636	3	1	8.7383 (−2)	1.1768 (1)	9.4043 (6)
$a^3S^e \rightarrow v^3P^o$	9.1101 (−2)			3	9	1.7947 (−2)	1.7730	3.9879 (5)
	0.4502	0.5423	9895	3	5	1.0080 (−2)	9.8500 (−1)	4.1206 (5)
	0.4502	0.5401	10128	3	3	5.9087 (−3)	5.9100 (−1)	3.8426 (5)
	0.4502	0.5397	10182	3	1	1.9591 (−3)	1.9700 (−1)	3.7814 (5)
$a^3S^e \rightarrow u^3P^o$	9.6253 (−2)			3	9	3.5306 (−2)	3.3012	8.7577 (5)
	0.4502	0.5460	9508	3	5	1.9532 (−2)	1.8340	8.6482 (5)
	0.4502	0.5468	9425	3	3	1.1822 (−2)	1.1004	8.8776 (5)
	0.4502	0.5471	9396	3	1	3.9529 (−3)	3.6681 (−1)	8.9605 (5)
$a^3S^e \rightarrow t^3P^o$	1.1223 (−1)			3	9	5.1695 (−3)	4.1455 (−1)	1.7434 (5)
	0.4502	0.5634	8049	3	5	2.8972 (−3)	2.3030 (−1)	1.7899 (5)
	0.4502	0.5613	8200	3	3	1.7062 (−3)	1.3818 (−1)	1.6926 (5)
	0.4502	0.5608	8237	3	1	5.6619 (−4)	4.6061 (−2)	1.6698 (5)
$a^3S^e \rightarrow s^3P^o$	1.1382 (−1)			3	9	3.1150 (−4)	2.4631 (−2)	1.0805 (4)
	0.4502	0.5636	8035	3	5	1.7245 (−4)	1.3684 (−2)	1.0691 (4)
	0.4502	0.5644	7976	3	3	1.0423 (−4)	8.2103 (−3)	1.0928 (4)
	0.4502	0.5647	7955	3	1	3.4833 (−5)	2.7368 (−3)	1.1014 (4)
$a^3S^e \rightarrow r^3P^o$	1.2272 (−1)			3	9	1.7204 (−3)	1.2617 (−1)	6.9369 (4)
	0.4502	0.5734	7394	3	5	9.5983 (−4)	7.0095 (−2)	7.0256 (4)
	0.4502	0.5724	7458	3	3	5.7104 (−4)	4.2057 (−2)	6.8493 (4)
	0.4502	0.5719	7489	3	1	1.8955 (−4)	1.4019 (−2)	6.7639 (4)
$b^3S^e \rightarrow v^3P^o$	1.6903 (−2)			3	9	3.8880 (−1)	2.07202 (2)	2.9743 (5)
	0.5244	0.5423	50910	3	5	2.2874 (−1)	1.1501 (2)	3.5321 (5)
	0.5244	0.5401	57758	3	3	1.2099 (−1)	6.9005 (1)	2.4199 (5)
	0.5244	0.5397	59565	3	1	3.9103 (−2)	2.3002 (1)	2.2057 (5)
$b^3S^e \rightarrow u^3P^o$	2.2005 (−2)			3	9	1.1993	4.8940 (2)	1.5619 (6)
	0.5244	0.5460	42098	3	5	6.5405 (−1)	2.7189 (2)	1.4774 (6)
	0.5244	0.5468	40516	3	3	4.0765 (−1)	1.6313 (2)	1.6562 (6)
	0.5244	0.5471	39991	3	1	1.3770 (−1)	5.4378 (1)	1.7233 (6)
$b^3S^e \rightarrow t^3P^o$	3.8035 (−2)			3	9	2.8584 (−2)	6.7637	1.1071 (5)
	0.5244	0.5634	23356	3	5	1.6291 (−2)	3.7576	1.1954 (5)
	0.5244	0.5613	24674	3	3	9.2512 (−3)	2.2546	1.0134 (5)
	0.5244	0.5608	25012	3	1	3.0420 (−3)	7.5152 (−1)	9.7283 (4)
$b^3S^e \rightarrow s^3P^o$	3.9623 (−2)			3	9	3.7977 (−2)	8.6260	1.5964 (5)
	0.5244	0.5636	23234	3	5	2.0884 (−2)	4.7922	1.5481 (5)
	0.5244	0.5644	22753	3	3	1.2795 (−2)	2.8753	1.6485 (5)
	0.5244	0.5647	22582	3	1	4.2970 (−3)	9.5845 (−1)	1.6858 (5)
$b^3S^e \rightarrow r^3P^o$	4.8521 (−2)			3	9	8.4782 (−3)	1.5726	5.3442 (4)
	0.5244	0.5734	18581	3	5	4.7605 (−3)	8.7366 (−1)	5.5175 (4)
	0.5244	0.5724	18985	3	3	2.7957 (−3)	5.2420 (−1)	5.1738 (4)
	0.5244	0.5719	19190	3	1	9.2200 (−4)	1.7473 (−1)	5.0106 (4)
$a^3P^e \rightarrow z^3P^o$	3.6187 (−1)			9	9	2.3548 (−1)	1.7570 (1)	2.4767 (8)
	0.0020	0.3641	2517	5	5	1.7671 (−1)	7.3207	1.8606 (8)
	0.0020	0.3623	2529	5	3	5.8612 (−2)	2.4402	1.0185 (8)
	0.0007	0.3641	2508	3	5	9.8530 (−2)	2.4402	6.2708 (7)
	0.0007	0.3623	2520	3	3	5.8829 (−2)	1.4641	6.1791 (7)
	0.0007	0.3616	2525	3	1	7.8286 (−2)	1.9522	2.4573 (8)
	0.0000	0.3623	2515	1	3	2.3577 (−1)	1.9522	8.2869 (7)
$a^3P^e \rightarrow y^3P^o$	4.5913 (−1)			9	9	5.3711 (−2)	3.1586	9.0943 (7)
	0.0020	0.4602	1989	5	5	4.0198 (−2)	1.3161	6.7774 (7)
	0.0020	0.4608	1986	5	3	1.3417 (−2)	4.3869 (−1)	3.7801 (7)
	0.0007	0.4602	1983	3	5	2.2397 (−2)	4.3869 (−1)	2.2789 (7)

Table V(a). ***(continued)***

	Si I							
Transition	E_i (Ry)	E_f (Ry)	WL (Å)	g_i	g_f	f_{ji}	S	a_{ji} (sec^{-1})
	0.0007	0.4608	1981	3	3	1.3456 (−2)	2.6321 (−1)	2.2878 (7)
	0.0007	0.4611	1979	3	1	1.7954 (−2)	3.5095 (−1)	9.1710 (7)
	0.0000	0.4608	1978	1	3	5.3905 (−2)	3.5095 (−1)	3.0644 (7)
$a^3P^e \rightarrow x^3P^o$	4.9460 (−1)			9	9	2.9185 (−2)	1.5932	5.7346 (7)
	0.0020	0.4969	1841	5	5	2.1901 (−2)	6.6384 (−1)	4.3080 (7)
	0.0020	0.4949	1849	5	3	7.2714 (−3)	2.2128 (−1)	2.3650 (7)
	0.0007	0.4969	1837	3	5	1.2200 (−2)	2.2128 (−1)	1.4476 (7)
	0.0007	0.4949	1844	3	3	7.2910 (−3)	1.3277 (−1)	1.4305 (7)
	0.0007	0.4943	1846	3	1	9.7092 (−3)	1.7702 (−1)	5.7006 (7)
	0.0000	0.4949	1841	1	3	2.9206 (−2)	1.7702 (−1)	1.9155 (7)
$a^3P^e \rightarrow w^3P^o$	5.1531 (−1)			9	9	1.1991 (−2)	6.2827 (−1)	2.5576 (7)
	0.0020	0.5166	1771	5	5	8.9804 (−3)	2.6178 (−1)	1.9100 (7)
	0.0020	0.5167	1771	5	3	2.9939 (−3)	8.7260 (−2)	1.0616 (7)
	0.0007	0.5166	1766	3	5	5.0020 (−3)	8.7260 (−2)	6.4162 (6)
	0.0007	0.5167	1766	3	3	3.0017 (−3)	5.2356 (−2)	6.4192 (6)
	0.0007	0.5170	1765	3	1	4.0046 (−3)	6.9808 (−2)	2.5721 (7)
	0.0000	0.5167	1764	1	3	1.2023 (−2)	6.9808 (−2)	8.5939 (6)
$a^3P^e \rightarrow v^3P^o$	5.3990 (−1)			9	9	1.1398 (−2)	5.6998 (−1)	2.6685 (7)
	0.0020	0.5423	1687	5	5	8.5533 (−3)	2.3749 (−1)	2.0050 (7)
	0.0020	0.5401	1693	5	3	2.8399 (−3)	7.9164 (−2)	1.1009 (7)
	0.0007	0.5423	1683	3	5	4.7636 (−3)	7.9164 (−2)	6.7330 (6)
	0.0007	0.5401	1689	3	3	2.8469 (−3)	4.7499 (−2)	6.6542 (6)
	0.0007	0.5397	1691	3	1	3.7926 (−3)	6.3331 (−2)	2.6546 (7)
	0.0000	0.5401	1687	1	3	1.1403 (−2)	6.3331 (−2)	8.9070 (6)
$a^3P^e \rightarrow u^3P^o$	5.4505 (−1)			9	9	3.4340 (−2)	1.7011	8.1943 (7)
	0.0020	0.5460	1675	5	5	2.5704 (−2)	7.0879 (−1)	6.1095 (7)
	0.0020	0.5468	1673	5	3	8.5813 (−3)	2.3626	3.4099 (7)
	0.0007	0.5460	1671	3	5	1.4315 (−2)	2.3626 (−1)	2.0515 (7)
	0.0007	0.5468	1669	3	3	8.6023 (−3)	1.4176 (−1)	2.0610 (7)
	0.0007	0.5471	1668	3	1	1.1476 (−2)	1.8901 (−1)	8.2575 (7)
	0.0000	0.5468	1666	1	3	3.4453 (−2)	1.8901 (−1)	2.7586 (7)
$a^3P^e \rightarrow t^3P^o$	5.6103 (−1)			9	9	7.3286 (−3)	3.5269 (−1)	1.8528 (7)
	0.0020	0.5634	1623	5	5	5.4995 (−3)	1.4696 (−1)	1.3919 (7)
	0.0020	0.5613	1629	5	3	1.8263 (−3)	4.8985 (−2)	7.6470 (6)
	0.0007	0.5634	1620	3	5	3.0625 (−3)	4.8985 (−2)	4.6729 (6)
	0.0007	0.5613	1626	3	3	1.8307 (−3)	2.9391 (−2)	4.6210 (6)
	0.0007	0.5608	1627	3	1	2.4387 (−3)	3.9188 (−2)	1.8435 (7)
	0.0000	0.5613	1624	1	3	7.3320 (−3)	3.9188 (−2)	6.1846 (6)
$a^3P^e \rightarrow s^3P^o$	5.6262 (−1)			9	9	2.9246 (−2)	1.4035	7.4358 (7)
	0.0020	0.5636	1623	5	5	2.1892 (−2)	5.8479 (−1)	5.5450 (7)
	0.0020	0.5644	1620	5	3	7.3083 (−3)	1.9493 (−1)	3.0942 (7)
	0.0007	0.5636	1619	3	5	1.2191 (−2)	1.9493 (−1)	1.8615 (7)
	0.0007	0.5644	1617	3	3	7.3255 (−3)	1.1696 (−1)	1.8698 (7)
	0.0007	0.5647	1616	3	1	9.7726 (−3)	1.5594 (−1)	7.4910 (7)
	0.0000	0.5644	1615	1	3	2.9339 (−2)	1.5594 (−1)	2.5023 (7)
$a^3P^e \rightarrow r^3P^o$	5.7152 (−1)			9	9	7.1614 (−3)	3.3832 (−1)	1.8789 (7)
	0.0020	0.5734	1595	5	5	5.3696 (−3)	1.4097 (−1)	1.4080 (7)
	0.0020	0.5724	1598	5	3	1.7866 (−3)	4.6989 (−2)	7.7797 (6)
	0.0007	0.5734	1591	3	5	2.9901 (−3)	4.6989 (−2)	4.7263 (6)
	0.0007	0.5724	1594	3	3	1.7908 (−3)	2.8194 (−2)	4.7006 (6)
	0.0007	0.5719	1596	3	1	2.3856 (−3)	3.7591 (−2)	1.8752 (7)
	0.0000	0.5724	1592	1	3	7.1719 (−3)	3.7591 (−2)	6.2906 (6)
$a^3P^e \rightarrow z^3D^o$	4.1147 (−1)			9	15	5.2046 (−2)	3.4152	4.2467 (7)
	0.0020	0.4130	2217	5	7	4.3665 (−2)	1.5937	4.2311 (7)
	0.0020	0.4128	2219	5	5	7.7926 (−3)	2.8460 (−1)	1.0559 (7)
	0.0020	0.4126	2220	5	3	5.1930 (−4)	1.8973 (−2)	1.1718 (6)
	0.0007	0.4128	2212	3	5	3.9089 (−2)	8.5379 (−1)	3.1985 (7)
	0.0007	0.4126	2212	3	3	1.3025 (−2)	2.8460 (−1)	1.7748 (7)
	0.0000	0.4126	2209	1	3	5.2188 (−2)	3.7946 (−1)	2.3786 (7)

continued

Table V(a). ***(continued)***

Transition	Si I E_i (Ry)	E_f (Ry)	WL (Å)	g_i	g_f	f_{if}	S	a_{fi} (sec^{-1})
$a^3P^e \rightarrow y^3D^o$	4.9278 (−1)			9	15	2.6931 (−1)	1.4756 (1)	3.1517 (8)
	0.0020	0.4944	1851	5	7	2.2605 (−1)	6.8862	3.1444 (8)
	0.0020	0.4939	1852	5	5	4.0327 (−2)	1.2297	7.8381 (7)
	0.0020	0.4938	1853	5	3	2.6875 (−3)	8.1979 (−2)	8.6995 (6)
	0.0007	0.4939	1847	3	5	2.0218 (−1)	3.6890	2.3706 (8)
	0.0007	0.4938	1848	3	3	6.7368 (−2)	1.2297	1.3155 (8)
	0.0000	0.4938	1846	1	3	2.6986 (−1)	1.6396	1.7616 (8)
$a^3P^e \rightarrow x^3D^o$	5.3699 (−1)			9	15	1.5518 (−1)	7.8026	2.1565 (8)
	0.0020	0.5387	1698	5	7	1.3028 (−1)	3.6412	2.1529 (8)
	0.0020	0.5382	1700	5	5	2.3240 (−2)	6.5021 (−1)	5.3654 (7)
	0.0020	0.5379	1700	5	3	1.5487 (−3)	4.3348 (−2)	5.9542 (6)
	0.0007	0.5382	1696	3	5	1.1649 (−1)	1.9506	1.6216 (8)
	0.0007	0.5379	1696	3	3	3.8813 (−2)	6.5021 (−1)	8.9981 (7)
	0.0000	0.5379	1694	1	3	1.5546 (−1)	8.6695 (−1)	1.2045 (8)
$a^3P^e \rightarrow w^3D^o$	5.5925 (−1)			9	15	8.4986 (−2)	4.1031	1.2810 (8)
	0.0020	0.5611	1630	5	7	7.1366 (−2)	1.9148	1.2798 (8)
	0.0020	0.5605	1632	5	5	1.2731 (−2)	3.4192 (−1)	3.1897 (7)
	0.0020	0.5600	1633	5	3	8.4784 (−4)	2.2795 (−2)	3.5329 (6)
	0.0007	0.5605	1628	3	5	6.3807 (−2)	1.0258	9.6378 (7)
	0.0007	0.5600	1629	3	3	2.1247 (−2)	3.4192 (−1)	5.3374 (7)
	0.0000	0.5600	1627	1	3	8.5093 (−2)	4.5590 (−1)	7.1434 (7)
$a^3P^e \rightarrow v^3D^o$	5.7164 (−1)			9	15	5.0205 (−2)	2.3713	7.9066 (7)
	0.0020	0.5735	1595	5	7	4.2161 (−2)	1.1066	7.9000 (7)
	0.0020	0.5734	1595	5	5	7.5274 (−3)	1.9761 (−1)	1.9740 (7)
	0.0020	0.5721	1599	5	3	5.0062 (−4)	1.3174 (−2)	2.1776 (6)
	0.0007	0.5734	1591	3	5	3.7725 (−2)	5.9282 (−1)	5.9634 (7)
	0.0007	0.5721	1595	3	3	1.2545 (−2)	1.9761 (−1)	3.2893 (7)
	0.0000	0.5721	1593	1	3	5.0241 (−2)	2.6348 (−1)	4.4019 (7)
$a^3P^e \rightarrow u^3D^o$	5.7908 (−1)			9	15	3.1695 (−2)	1.4778	5.1222 (7)
	0.0020	0.5810	1574	5	7	2.6620 (−2)	6.8964 (−1)	5.1199 (7)
	0.0020	0.5809	1574	5	5	4.7528 (−3)	1.2315 (−1)	1.2794 (7)
	0.0020	0.5793	1578	5	3	3.1598 (−4)	8.2100 (−3)	1.4098 (6)
	0.0007	0.5809	1571	3	5	2.3819 (−2)	3.6945 (−1)	3.8647 (7)
	0.0007	0.5793	1575	3	3	7.9176 (−3)	1.2315 (−1)	2.1293 (7)
	0.0000	0.5793	1573	1	3	3.1709 (−2)	1.6420 (−1)	2.8495 (7)
$b^3P^e \rightarrow y^3P^o$	1.2806 (−2)			9	9	2.4189 (−2)	5.1000 (1)	3.1862 (4)
	0.4482	0.4602	76265	5	5	1.6929 (−2)	2.1250 (1)	1.9418 (4)
	0.4482	0.4608	72581	5	3	5.9263 (−3)	7.0833	1.2496 (4)
	0.4471	0.4602	69481	3	5	1.0326 (−2)	7.0833	8.5661 (3)
	0.4471	0.4608	66410	3	3	6.4788 (−3)	4.2500	9.7959 (3)
	0.4471	0.4611	64858	3	1	8.8462 (−3)	5.6666	4.2079 (4)
	0.4468	0.4608	65015	1	3	2.6463 (−2)	5.6666	1.3907 (4)
$b^3P^e \rightarrow x^3P^o$	4.8271 (−2)			9	9	3.0139 (−1)	1.6858 (2)	5.6407 (6)
	0.4482	0.4969	18728	5	5	2.2786 (−1)	7.0240 (1)	4.3336 (6)
	0.4482	0.4949	19511	5	3	7.2894 (−2)	2.3413 (1)	2.1282 (6)
	0.4471	0.4969	18289	3	5	1.2963 (−1)	2.3413 (1)	1.5513 (6)
	0.4471	0.4949	19036	3	3	7.4720 (−2)	1.4048 (1)	1.3753 (6)
	0.4471	0.4943	19289	3	1	9.8336 (−2)	1.8731 (1)	5.2902 (6)
	0.4468	0.4949	18920	1	3	3.0069 (−1)	1.8731 (1)	1.8673 (6)
$b^3P^e \rightarrow w^3P^o$	6.8988 (−2)			9	9	1.9102 (−1)	7.4758 (1)	7.3023 (6)
	0.4482	0.5166	13329	5	5	1.4198 (−1)	3.1149 (1)	5.3307 (6)
	0.4482	0.5167	13313	5	3	4.7381 (−2)	1.0383 (1)	2.9719 (6)
	0.4471	0.5166	13106	3	5	8.0226 (−2)	1.0383 (1)	1.8697 (6)
	0.4471	0.5167	13090	3	3	4.8191 (−2)	6.2298	1.8762 (6)
	0.4471	0.5170	13033	3	1	6.4532 (−2)	8.3064	7.6021 (6)
	0.4468	0.5167	13034	1	3	1.9357 (−1)	8.3064	2.5329 (6)
$b^3P^e \rightarrow v^3P^o$	9.3575 (−2)			9	9	2.0654 (−2)	5.9595	1.4527 (6)
	0.4482	0.5423	9692	5	5	1.5564 (−2)	2.4831	1.1051 (6)
	0.4482	0.5401	9916	5	3	5.0711 (−3)	8.2771 (−1)	5.7335 (5)

Table V(a). ***(continued)***

	Si I							
Transition	E_i (Ry)	E_f (Ry)	WL (Å)	g_i	g_f	f_{if}	S	a_{ji} (sec^{-1})
	0.4471	0.5423	9573	3	5	8.7544 (−3)	8.2771 (−1)	3.8229 (5)
	0.4471	0.5401	9792	3	3	5.1357 (−3)	4.9663 (−1)	3.5732 (5)
	0.4471	0.5397	9842	3	1	6.8122 (−3)	6.6217 (−1)	1.4073 (6)
	0.4468	0.5401	9761	1	3	2.0607 (−2)	6.6217 (−1)	4.8089 (5)
$b^3P^e \rightarrow u^3P^o$	9.8727 (−2)			9	9	6.6030 (−3)	1.8058	5.1695 (5)
	0.4482	0.5460	9321	5	5	4.9042 (−3)	7.5241 (−1)	3.7655 (5)
	0.4482	0.5468	9241	5	3	1.6488 (−3)	2.5080 (−1)	2.1463 (5)
	0.4471	0.5460	9211	3	5	2.7572 (−3)	2.5080 (−1)	1.3008 (5)
	0.4471	0.5468	9133	3	3	1.6683 (−3)	1.5048 (−1)	1.3342 (5)
	0.4471	0.5471	9106	3	1	2.2311 (−3)	2.0064 (−1)	5.3849 (5)
	0.4468	0.5468	9106	1	3	6.6928 (−3)	2.0064 (−1)	1.7944 (5)
$b^3P^e \rightarrow t^3P^o$	1.1471 (−1)			9	9	6.3958 (−3)	1.5055	6.7595 (5)
	0.4482	0.5634	7915	5	5	4.8150 (−3)	6.2728 (−1)	5.1273 (5)
	0.4482	0.5613	8060	5	3	1.5759 (−3)	2.0909 (−1)	2.6962 (5)
	0.4471	0.5634	7835	3	5	2.7022 (−3)	2.0909 (−1)	1.7617 (5)
	0.4471	0.5613	7978	3	3	1.5922 (−3)	1.2546 (−1)	1.6684 (5)
	0.4471	0.5608	8013	3	1	2.1136 (−3)	1.6727 (−1)	6.5865 (5)
	0.4468	0.5613	7958	1	3	6.3849 (−3)	1.6727 (−1)	2.2416 (5)
$b^3P^e \rightarrow s^3P^o$	1.1630 (−1)			9	9	8.8166 (−6)	2.0469 (−3)	9.5778 (2)
	0.4482	0.5636	7901	5	5	6.5581 (−6)	8.5289 (−4)	7.0077 (2)
	0.4482	0.5644	7844	5	3	2.2018 (−6)	2.8430 (−4)	3.9778 (2)
	0.4471	0.5636	7821	3	5	3.6804 (−6)	2.8430 (−4)	2.4077 (2)
	0.4471	0.5644	7766	3	3	2.2240 (−6)	1.7058 (−4)	2.4595 (2)
	0.4471	0.5647	7746	3	1	2.9729 (−6)	2.2744 (−4)	9.9138 (2)
	0.4468	0.5644	7747	1	3	8.9178 (−6)	2.2744 (−4)	3.3038 (2)
$b^3P^e \rightarrow r^3P^o$	1.2519 (−1)			9	9	3.3771 (−3)	7.2833 (−1)	4.2515 (5)
	0.4482	0.5734	7281	5	5	2.5322 (−3)	3.0347 (−1)	3.1861 (5)
	0.4482	0.5724	7342	5	3	8.3704 (−4)	1.0116 (−1)	1.7263 (5)
	0.4471	0.5734	7213	3	5	1.4199 (−3)	1.0116 (−1)	1.0921 (5)
	0.4471	0.5724	7274	3	3	8.4493 (−4)	6.0694 (−2)	1.0653 (5)
	0.4471	0.5719	7303	3	1	1.1220 (−3)	8.0926 (−2)	4.2095 (5)
	0.4468	0.5724	7257	1	3	3.3875 (−3)	8.0926 (−2)	1.4303 (5)
$b^3P^e \rightarrow y^3D^o$	4.6452 (−2)			9	15	6.1132 (−1)	3.5533 (2)	6.3571 (6)
	0.4482	0.4944	19728	5	7	5.1061 (−1)	1.6582 (2)	6.2502 (6)
	0.4482	0.4939	19934	5	5	9.0233 (−2)	2.9611 (1)	1.5143 (6)
	0.4482	0.4938	20013	5	3	5.9919 (−3)	1.9740	1.6628 (5)
	0.4471	0.4939	19438	3	5	4.6271 (−1)	8.8832 (1)	4.9009 (6)
	0.4471	0.4938	19513	3	3	1.5365 (−1)	2.9611 (1)	2.6915 (6)
	0.4468	0.4938	19391	1	3	6.1840 (−1)	3.9481 (1)	3.6559 (6)
$b^3P^e \rightarrow x^3D^o$	9.0662 (−2)			9	15	3.7894 (−2)	1.1285 (1)	1.5011 (6)
	0.4482	0.5387	10071	5	7	3.1767 (−2)	5.2664	1.4921 (6)
	0.4482	0.5382	10134	5	5	5.6376 (−3)	9.4044 (−1)	3.6614 (5)
	0.4482	0.5379	10159	5	3	3.7492 (−4)	6.2696 (−2)	4.0384 (4)
	0.4471	0.5382	10004	3	5	2.8555 (−2)	2.8213	1.1418 (6)
	0.4471	0.5379	10028	3	3	9.4953 (−3)	9.4044 (−1)	6.2977 (5)
	0.4468	0.5379	9996	1	3	3.8102 (−2)	1.2539	8.4776 (5)
$b^3P^e \rightarrow w^3D^o$	1.1292 (−1)			9	15	2.7947 (−2)	6.6823	1.7175 (6)
	0.4482	0.5611	8074	5	7	2.3465 (−2)	3.1184	1.7151 (6)
	0.4482	0.5605	8115	5	5	4.1690 (−3)	5.5686 (−1)	4.2231 (5)
	0.4482	0.5600	8157	5	3	2.7647 (−4)	3.7124 (−2)	4.6188 (4)
	0.4471	0.5605	8031	3	5	2.1062 (−2)	1.6706	1.3069 (6)
	0.4471	0.5600	8073	3	3	6.9843 (−3)	5.5686 (−1)	7.1481 (5)
	0.4468	0.5600	8052	1	3	2.8009 (−2)	7.4248 (−1)	9.6044 (5)
$b^3P^e \rightarrow v^3D^o$	1.2532 (−1)			9	15	1.6533 (−2)	3.5619	1.2513 (6)
	0.4482	0.5735	7274	5	7	1.3883 (−2)	1.6622	1.2501 (6)
	0.4482	0.5734	7280	5	5	2.4771 (−3)	2.9683 (−1)	3.1178 (5)
	0.4482	0.5721	7360	5	3	1.6333 (−4)	1.9788 (−2)	3.3518 (4)
	0.4471	0.5734	7212	3	5	1.2501 (−2)	8.9048 (−1)	9.6182 (5)

continued

Table V(a). ***(continued)***

Si I

Transition	E_i (Ry)	E_f (Ry)	WL (Å)	g_i	g_f	f_{if}	S	a_{ji} (sec^{-1})
	0.4471	0.5721	7292	3	3	4.1219 (−3)	2.9683 (−1)	5.1715 (5)
	0.4468	0.5721	7274	1	3	1.6526 (−2)	3.9577 (−1)	6.9435 (5)
$b^3P^e \rightarrow u^3D^o$	1.3276 (−1)			9	15	1.0236 (−2)	2.0818	8.6946 (5)
	0.4482	0.5810	6863	5	7	8.6005 (−3)	9.7152 (−1)	8.7009 (5)
	0.4482	0.5809	6867	5	5	1.5348 (−3)	1.7349 (−1)	2.1708 (5)
	0.4482	0.5793	6951	5	3	1.0108 (−4)	1.1566 (−2)	2.3258 (4)
	0.4471	0.5809	6807	3	5	7.7415 (−3)	5.2046 (−1)	6.6862 (5)
	0.4471	0.5793	6890	3	3	2.5497 (−3)	1.7349 (−1)	3.5830 (5)
	0.4468	0.5793	6874	1	3	1.0221 (−2)	2.3131 (−1)	4.8088 (5)
$c^3P^e \rightarrow v^3P^o$	1.8173 (−2)			9	9	4.1793 (−1)	6.2094 (2)	1.1086 (6)
	0.5237	0.5423	49069	5	5	3.2030 (−1)	2.5872 (2)	8.8719 (5)
	0.5237	0.5401	55400	5	3	9.4578 (−2)	8.6241 (1)	3.4262 (5)
	0.5224	0.5423	45927	3	5	1.9011 (−1)	8.6241 (1)	3.6065 (5)
	0.5224	0.5401	51427	3	3	1.0188 (−1)	5.1745 (1)	2.5695 (5)
	0.5224	0.5397	52855	3	1	1.3216 (−1)	6.8993 (1)	9.4653 (5)
	0.5221	0.5401	50571	1	3	4.1442 (−1)	6.8993 (1)	3.6030 (5)
$c^3P^e \rightarrow u^3P^o$	2.3324 (−2)			9	9	3.1979 (−1)	3.7018 (2)	1.3974 (6)
	0.5237	0.5460	40831	5	5	2.2951 (−1)	1.5424 (2)	9.1841 (5)
	0.5237	0.5468	39341	5	3	7.9384 (−2)	5.1415 (1)	5.7003 (5)
	0.5224	0.5460	38632	3	5	1.3476 (−1)	5.1415 (1)	3.6142 (5)
	0.5224	0.5468	37295	3	3	8.3737 (−2)	3.0849 (1)	4.0142 (5)
	0.5224	0.5471	36850	3	1	1.1302 (−1)	4.1132 (1)	1.6656 (6)
	0.5521	0.5468	36843	1	3	3.3906 (−1)	4.1132 (1)	5.5519 (5)
$c^3P^e \rightarrow t^3P^o$	3.9304 (−2)			9	9	2.5380 (−2)	1.7435 (1)	3.1492 (5)
	0.5237	0.5634	22961	5	5	1.9222 (−2)	7.2645	2.4322 (5)
	0.5237	0.5613	24233	5	3	6.0699 (−3)	2.4215	1.1488 (5)
	0.5224	0.5634	22249	3	5	1.1021 (−2)	2.4215	8.9107 (4)
	0.5224	0.5613	23441	3	3	6.2749 (−3)	1.4529	7.6151 (4)
	0.5224	0.5608	23746	3	1	8.2589 (−3)	1.9372	2.9300 (5)
	0.5221	0.5613	23262	1	3	2.5293 (−2)	1.9372	1.0390 (5)
$c^3P^e \rightarrow s^3P^o$	4.0893 (−2)			9	9	1.2339 (−2)	8.1473	1.6574 (5)
	0.5237	0.5636	22843	5	5	9.0276 (−3)	3.3947	1.1538 (5)
	0.5237	0.5644	22378	5	3	3.0718 (−3)	1.1316	6.8166 (4)
	0.5224	0.5636	22138	3	5	5.1750 (−3)	1.1316	4.2252 (4)
	0.5224	0.5644	21701	3	3	3.1676 (−3)	6.7894 (−1)	4.4860 (4)
	0.5224	0.5647	21545	3	1	4.2537 (−3)	9.0525 (−1)	1.8332 (5)
	0.5221	0.5644	21547	1	3	1.2761 (−2)	9.0525 (−1)	6.1105 (4)
$c^3P^e \rightarrow r^3P^o$	4.9791 (−2)			9	9	7.5471 (−3)	4.0925	1.5028 (5)
	0.5237	0.5734	18330	5	5	5.6511 (−3)	1.7052	1.1217 (5)
	0.5237	0.5724	18724	5	3	1.8443 (−3)	5.6841 (−1)	5.8484 (4)
	0.5224	0.5734	17873	3	5	3.2197 (−3)	5.6841 (−1)	4.0328 (4)
	0.5224	0.5724	18248	3	3	1.8924 (−3)	3.4104 (−1)	3.7910 (4)
	0.5224	0.5719	18436	3	1	2.4975 (−3)	4.5473 (−1)	1.4704 (5)
	0.5221	0.5724	18139	1	3	7.6152 (−3)	4.5473 (−1)	5.1463 (4)
$c^3P^e \rightarrow x^3D^o$	1.5259 (−2)			9	15	8.9328 (−1)	1.5806 (3)	1.0024 (6)
	0.5237	0.5387	60614	5	7	7.3908 (−1)	7.3761 (2)	9.5790 (5)
	0.5237	0.5382	62962	5	5	1.2706 (−1)	1.3172 (2)	2.1369 (5)
	0.5237	0.5379	63941	5	3	8.3420 (−3)	8.7810	2.2677 (4)
	0.5224	0.5382	57880	3	5	6.9107 (−1)	3.9515 (2)	8.2512 (5)
	0.5224	0.5379	58706	3	3	2.2714 (−1)	1.3172 (2)	4.3945 (5)
	0.5221	0.5379	57593	1	3	9.2611 (−1)	1.7562 (2)	6.2057 (5)
$c^3P^e \rightarrow w^3D^o$	3.7519 (−2)			9	15	1.7303 (−2)	1.2452 (1)	1.1739 (5)
	0.5237	0.5611	24351	5	7	1.4496 (−2)	5.8107	1.1646 (5)
	0.5237	0.5605	24731	5	5	2.5491 (−3)	1.0376	2.7804 (4)
	0.5237	0.5600	25128	5	3	1.6722 (−4)	6.9175 (−2)	2.9433 (3)
	0.5224	0.5605	23906	3	5	1.3185 (−2)	3.1129	9.2336 (4)
	0.5224	0.5600	24277	3	3	4.3269 (−3)	1.0376	4.8952 (4)
	0.5221	0.5600	24085	1	3	1.7446 (−2)	1.3835	6.6848 (4)

Table V(a). ***(continued)***

Si I

Transition	E_i (Ry)	E_f (Ry)	WL (Å)	g_i	g_f	f_{if}	S	a_{ji} (sec^{-1})
$c^3P^o \rightarrow v^3D^o$	4.9917 (−2)			9	15	1.5649 (−2)	8.4647	1.8792 (5)
	0.5237	0.5735	18289	5	7	1.3122 (−2)	3.9502	1.8694 (5)
	0.5237	0.5734	18323	5	5	2.3386 (−3)	7.0539 (−1)	4.6455 (4)
	0.5237	0.5721	18844	5	3	1.5161 (−4)	4.7026 (−2)	4.7467 (3)
	0.5224	0.5734	17867	3	5	1.1992 (−2)	2.1162	1.5032 (5)
	0.5224	0.5721	18361	3	3	3.8898 (−3)	7.0539 (−1)	7.6958 (4)
	0.5221	0.5721	18251	1	3	1.5653 (−2)	9.4052 (−1)	1.0448 (5)
$c^3P^o \rightarrow u^3D^o$	5.7355 (−2)			9	15	1.0286 (−2)	4.8420	1.6307 (5)
	0.5237	0.5810	15893	5	7	8.6377 (−3)	2.2596	1.6294 (5)
	0.5237	0.5809	15918	5	5	1.5400 (−3)	4.0350 (−1)	4.0543 (4)
	0.5237	0.5793	16374	5	3	9.9799 (−5)	2.6900 (−2)	4.1376 (3)
	0.5224	0.5809	15572	3	5	7.8710 (−3)	1.2105	1.2990 (5)
	0.5224	0.5793	16009	3	3	2.5519 (−3)	4.0350 (−1)	6.6410 (4)
	0.5221	0.5793	15925	1	3	1.0261 (−2)	5.3800 (−1)	8.9954 (4)
$z^3P^o \rightarrow a^3S^e$	8.6933 (−2)			9	3	1.1777 (−1)	3.6577 (1)	2.1446 (7)
	0.3641	0.4502	10588	5	3	1.1659 (−1)	2.0320 (1)	1.1559 (7)
	0.3623	0.4502	10374	3	3	1.1900 (−1)	1.2192 (1)	7.3749 (6)
	0.3616	0.4502	10292	1	3	1.1994 (−1)	4.0641	2.5175 (6)
$z^3P^o \rightarrow b^3S^e$	1.6113 (−1)			9	3	3.3298 (−3)	5.5796 (−1)	2.0832 (6)
	0.3641	0.5244	5686	5	3	3.3118 (−3)	3.0998 (−1)	1.1387 (6)
	0.3623	0.5244	5624	3	3	3.3486 (−3)	1.8599 (−1)	7.0623 (5)
	0.3616	0.5244	5599	1	3	3.3631 (−3)	6.1996 (−2)	2.3847 (5)
$z^3P^o \rightarrow b^3P^e$	8.4458 (−2)			9	9	4.0965 (−1)	1.3096 (2)	2.3471 (7)
	0.3641	0.4482	10830	5	5	3.0608 (−1)	5.4566 (1)	1.7405 (7)
	0.3641	0.4471	10982	5	3	1.0061 (−1)	1.8189 (1)	9.2717 (6)
	0.3623	0.4482	10606	3	5	1.7364 (−1)	1.8189 (1)	6.1778 (6)
	0.3623	0.4471	10752	3	3	1.0277 (−1)	1.0913 (1)	5.9288 (6)
	0.3623	0.4468	10790	3	1	1.3655 (−1)	1.4551 (1)	2.3473 (7)
	0.3616	0.4471	10664	1	3	4.1446 (−1)	1.4551 (1)	8.1026 (6)
$z^3P^o \rightarrow c^3P^e$	1.5986 (−1)			9	9	1.4875 (−2)	2.5124	3.0534 (6)
	0.3641	0.5237	5710	5	5	1.1138 (−2)	1.0468	2.2785 (6)
	0.3641	0.5224	5756	5	3	3.6830 (−3)	3.4895 (−1)	1.2358 (6)
	0.3623	0.5237	5647	3	5	6.2566 (−3)	3.4895 (−1)	7.8518 (5)
	0.3623	0.5224	5692	3	3	3.7244 (−3)	2.0937 (−1)	7.6679 (5)
	0.3623	0.5221	5703	3	1	4.9566 (−3)	2.7916 (−1)	3.0500 (6)
	0.3616	0.5224	5667	1	3	1.4963 (−2)	2.7916 (−1)	1.0359 (6)
$z^3P^o \rightarrow a^3D^e$	7.5649 (−2)			9	15	5.9962 (−1)	2.1401 (2)	1.6538 (7)
	0.3641	0.4398	12035	5	7	5.0416 (−1)	9.9872 (1)	1.6584 (7)
	0.3641	0.4383	12274	5	5	8.8268 (−2)	1.7834 (1)	3.9077 (6)
	0.3641	0.4376	12399	5	3	5.8251 (−3)	1.1890	4.2116 (5)
	0.3623	0.4383	11987	3	5	4.5192 (−1)	5.3503 (1)	1.2587 (7)
	0.3623	0.4376	12107	3	3	1.4915 (−1)	1.7834 (1)	6.7876 (6)
	0.3616	0.4376	11995	1	3	6.0217 (−1)	2.3779 (1)	9.3050 (6)
$z^3P^o \rightarrow b^3D^e$	1.5705 (−1)			9	15	4.2795 (−3)	7.3574 (−1)	5.0868 (5)
	0.3641	0.5212	5799	5	7	3.5967 (−3)	3.4335 (−1)	5.0948 (5)
	0.3641	0.5196	5861	5	5	6.3552 (−4)	6.1312 (−2)	1.2340 (5)
	0.3641	0.5192	5874	5	3	4.2270 (−5)	4.0875 (−3)	1.3616 (4)
	0.3623	0.5196	5795	3	5	3.2140 (−3)	1.8394 (−1)	3.8306 (5)
	0.3623	0.5192	5808	3	3	1.0689 (−3)	6.1312 (−2)	2.1135 (5)
	0.3616	0.5192	5782	1	3	4.2946 (−3)	8.1749 (−2)	2.8559 (5)
$y^3P^o \rightarrow b^3S^e$	6.3866 (−2)			9	3	2.8035 (−3)	1.1852	2.7555 (5)
	0.4602	0.5244	14200	5	3	2.8169 (−3)	6.5846 (−1)	1.5528 (5)
	0.4608	0.5244	14336	3	3	2.7905 (−3)	3.9508 (−1)	9.0580 (4)
	0.4611	0.5244	14410	1	3	2.7761 (−3)	1.3169 (−1)	2.9725 (4)
$y^3P^o \rightarrow c^3P^e$	6.2597 (−2)			9	9	1.5020 (−3)	6.4784 (−1)	4.7271 (4)
	0.4602	0.5237	14350	5	5	1.1427 (−3)	2.6993 (−1)	3.7011 (4)
	0.4602	0.5224	14644	5	3	3.7329 (−4)	8.9978 (−2)	1.9352 (4)

continued

Table V(a). ***(continued)***

Si I

Transition	E_i (Ry)	E_f (Ry)	WL (Å)	g_i	g_f	f_{if}	S	a_{ji} (sec^{-1})
	0.4608	0.5237	14489	3	5	6.2885 (−4)	8.9978 (−2)	1.1990 (4)
	0.4608	0.5224	14788	3	3	3.6969 (−4)	5.3987 (−2)	1.1279 (4)
	0.4608	0.5221	14860	3	1	4.9052 (−4)	7.1983 (−2)	4.4459 (4)
	0.4611	0.5224	14867	1	3	1.4708 (−3)	7.1983 (−2)	1.4798 (4)
$y^3P^o \rightarrow b^3D^e$	5.9783 (−2)			9	15	1.3468 (−3)	6.0824 (−1)	2.3198 (4)
	0.4602	0.5212	14929	5	7	1.1551 (−3)	2.8385 (−1)	2.4691 (4)
	0.4602	0.5196	15343	5	5	2.0069 (−4)	5.0687 (−2)	5.6856 (3)
	0.4602	0.5192	15436	5	3	1.3298 (−5)	3.3791 (−3)	6.2032 (2)
	0.4608	0.5196	15501	3	5	9.9329 (−4)	1.5206 (−1)	1.6545 (4)
	0.4608	0.5192	15596	3	3	3.2907 (−4)	5.0687 (−2)	9.0239 (3)
	0.4611	0.5192	15684	1	3	1.3088 (−3)	6.7582 (−2)	1.1829 (4)
$x^3P^o \rightarrow b^3S^e$	2.8401 (−2)			9	3	1.7871 (−1)	1.6990 (2)	3.4735 (6)
	0.4969	0.5244	33182	5	3	1.7279 (−1)	9.4387 (1)	1.7442 (6)
	0.4949	0.5244	30978	3	3	1.8512 (−1)	5.6632 (1)	1.2870 (6)
	0.4943	0.5244	30332	1	3	1.8903 (−1)	1.8877 (1)	4.5671 (5)
$x^3P^o \rightarrow c^3P^e$	2.7131 (−2)			9	9	5.5737 (−1)	5.5468 (2)	3.2955 (6)
	0.4969	0.5237	34013	5	5	4.1277 (−1)	2.3111 (2)	2.3795 (6)
	0.4969	0.5224	35707	5	3	1.3107 (−1)	7.7038 (1)	1.1427 (6)
	0.4949	0.5237	31702	3	5	2.4609 (−1)	7.7038 (1)	9.8031 (5)
	0.4949	0.5224	33168	3	3	1.4113 (−1)	4.6223 (1)	8.5606 (5)
	0.4949	0.5221	33534	3	1	1.8612 (−1)	6.1631 (1)	3.3133 (6)
	0.4943	0.5224	32428	1	3	5.7727 (−1)	6.1631 (1)	1.2204 (6)
$x^3P^o \rightarrow b^3D^e$	2.4318 (−2)			9	15	8.9256 (−1)	9.9099 (2)	2.5438 (6)
	0.4969	0.5212	37456	5	7	7.5011 (−1)	4.6246 (2)	2.5475 (6)
	0.4969	0.5196	40172	5	5	1.2486 (−1)	8.2582 (1)	5.1590 (5)
	0.4969	0.5192	40816	5	3	8.1922 (−3)	5.5055	5.4635 (4)
	0.4949	0.5196	36987	3	5	6.7828 (−1)	2.4775 (2)	1.9846 (6)
	0.4949	0.5192	37531	3	3	2.2279 (−1)	8.2582 (1)	1.0549 (6)
	0.4943	0.5192	36587	1	3	9.1391 (−1)	1.1011 (2)	1.5171 (6)
$w^3P^o \rightarrow b^3S^e$	7.6836 (−3)			9	3	8.3264 (−2)	2.9259 (2)	1.1845 (5)
	0.5166	0.5244	117507	5	3	8.3983 (−2)	1.6255 (2)	6.7528 (4)
	0.5167	0.5244	118812	3	3	8.3116 (−2)	9.7529 (1)	3.9275 (4)
	0.5170	0.5244	123680	1	3	7.9865 (−2)	3.2510 (1)	1.1615 (4)
$w^3P^o \rightarrow c^3P^e$	6.4141 (−3)			9	9	4.6789 (−2)	1.9696 (2)	1.5461 (4)
	0.5166	0.5237	128644	5	5	3.8739 (−2)	8.2065 (1)	1.5596 (4)
	0.5166	0.5224	156768	5	3	1.0596 (−2)	2.7355 (1)	4.7881 (3)
	0.5167	0.5237	130210	3	5	2.1276 (−2)	2.7355 (1)	5.0243 (3)
	0.5167	0.5224	159099	3	3	1.0450 (−2)	1.6413 (1)	2.7558 (3)
	0.5167	0.5221	167889	3	1	1.3203 (−2)	2.1884 (1)	9.3808 (3)
	0.5170	0.5224	167952	1	3	3.9610 (−2)	2.1884 (1)	3.1269 (3)
$w^3P^o \rightarrow b^3D^e$	3.6009 (−3)			9	15	2.6283 (−3)	1.9707 (1)	1.6424 (2)
	0.5166	0.5212	197190	5	7	2.8325 (−3)	9.1965	3.4687 (2)
	0.5166	0.5196	306191	5	5	3.2516 (−4)	1.6422	2.3038 (1)
	0.5166	0.5192	348004	5	3	1.9050 (−5)	1.0948 (−1)	1.7372
	0.5167	0.5196	315213	3	5	1.5820 (−3)	4.9267	6.3679 (1)
	0.5167	0.5192	359704	3	3	4.6165 (−4)	1.6422	2.3735 (1)
	0.5170	0.5192	408370	1	3	1.6276 (−3)	2.1896	2.1671 (1)
$a^3D^e \rightarrow y^3P^o$	2.1615 (−2)			15	9	1.3569 (−3)	2.8248	8.4864 (3)
	0.4398	0.4602	44732	7	5	1.2787 (−3)	1.3182	5.9664 (3)
	0.4383	0.4602	41710	5	5	3.4290 (−4)	2.3540 (−1)	1.3149 (3)
	0.4376	0.4602	40326	3	5	3.9408 (−5)	1.5693 (−2)	9.7004 (1)
	0.4383	0.4608	40583	5	3	1.0570 (−3)	7.0620 (−1)	7.1314 (3)
	0.4376	0.4608	39272	3	3	6.0681 (−4)	2.3540 (−1)	2.6234 (3)
	0.4376	0.4611	38724	3	1	8.2059 (−4)	3.1387 (−1)	1.0948 (4)
$a^3D^e \rightarrow x^3P^o$	5.7080 (−2)			15	9	2.2527 (−1)	1.7760 (2)	9.8258 (6)
	0.4398	0.4969	15964	7	5	2.2527 (−1)	8.2879 (1)	8.2536 (6)
	0.4383	0.4969	15562	5	5	5.7779 (−2)	1.4800 (1)	1.5915 (6)
	0.4376	0.4969	15365	3	5	6.5021 (−3)	9.8666 (−1)	1.1023 (5)
	0.4383	0.4949	16099	5	3	1.6753 (−1)	4.4400 (1)	7.1849 (6)

Table V(a). ***(continued)***

Si I

Transition	E_i (Ry)	E_f (Ry)	WL (Å)	g_i	g_f	f_{if}	S	a_{ji} (sec^{-1})
	0.4376	0.4949	15889	3	3	9.4308 (−2)	1.4800 (1)	2.4914 (6)
	0.4376	0.4943	16064	3	1	1.2438 (−1)	1.9733 (1)	9.6461 (6)
$a^3D^e \rightarrow w^3P^o$	7.7797 (−2)			15	9	6.4778 (−3)	3.7469	5.2486 (5)
	0.4398	0.5166	11867	7	5	6.3939 (−3)	1.7486	4.2398 (5)
	0.4383	0.5166	11643	5	5	1.6293 (−3)	3.1224 (−1)	8.0173 (4)
	0.4376	0.5166	11533	3	5	1.8277 (−4)	2.0816 (−2)	5.5000 (3)
	0.4383	0.5167	11631	5	3	4.8929 (−3)	9.3673 (−1)	4.0209 (5)
	0.4376	0.5167	11521	3	3	2.7443 (−3)	3.1224 (−1)	1.3792 (5)
	0.4376	0.5170	11477	3	1	3.6729 (−3)	4.1633 (−1)	5.5797 (5)
$a^3D^e \rightarrow v^3P^o$	1.0238 (−1)			15	9	2.3641 (−2)	1.0391 (1)	3.3175 (6)
	0.4398	0.5423	8895	7	5	2.3653 (−2)	4.8489	2.7913 (6)
	0.4383	0.5423	8769	5	5	5.9988 (−3)	8.6588 (−1)	5.2035 (5)
	0.4376	0.5423	8706	3	5	6.7134 (−4)	5.7725 (−2)	3.5447 (4)
	0.4383	0.5401	8952	5	3	1.7629 (−2)	2.5976	2.4458 (6)
	0.4376	0.5401	8886	3	3	9.8662 (−3)	8.6588 (−1)	8.3341 (5)
	0.4376	0.5397	8928	3	1	1.3093 (−2)	1.1545	3.2870 (6)
$a^3D^e \rightarrow u^3P^o$	1.0754 (−1)			15	9	3.3204 (−4)	1.3895 (−1)	5.1403 (4)
	0.4398	0.5460	8581	7	5	3.2789 (−4)	6.4843 (−2)	4.1577 (4)
	0.4383	0.5460	8464	5	5	8.3115 (−5)	1.1579 (−2)	7.7393 (3)
	0.4376	0.5460	8405	3	5	9.2993 (−6)	7.7194 (−4)	5.2681 (2)
	0.4383	0.5468	8398	5	3	2.5129 (−4)	3.4737 (−2)	3.9609 (4)
	0.4376	0.5468	8340	3	3	1.4057 (−4)	1.1579 (−2)	1.3479 (4)
	0.4376	0.5471	8318	3	1	1.8794 (−4)	1.5439 (−2)	5.4361 (4)
$a^3D^e \rightarrow t^3P^o$	1.2352 (−1)			15	9	7.6282 (−3)	2.7792	1.5580 (6)
	0.4398	0.5634	7375	7	5	7.6310 (−3)	1.2969	1.3101 (6)
	0.4383	0.5634	7288	5	5	1.9306 (−3)	2.3160 (−1)	2.4245 (5)
	0.4376	0.5634	7245	3	5	2.1580 (−4)	1.5440 (−2)	1.6456 (4)
	0.4383	0.5613	7412	5	3	5.6950 (−3)	6.9479 (−1)	1.1525 (6)
	0.4376	0.5613	7367	3	3	3.1832 (−3)	2.3160 (−1)	3.9123 (5)
	0.4376	0.5608	7396	3	1	4.2271 (−3)	3.0880 (−1)	1.5460 (6)
$a^3D^e \rightarrow s^3P^o$	1.2510 (−1)			15	9	4.0779 (−6)	1.4558 (−3)	8.5442 (2)
	0.4398	0.5636	7363	7	5	4.0341 (−6)	6.8452 (−4)	6.9482 (2)
	0.4383	0.5636	7276	5	5	1.0206 (−6)	1.2224 (−4)	1.2858 (2)
	0.4376	0.5636	7233	3	5	1.1408 (−7)	8.1491 (−6)	8.7269
	0.4383	0.5644	7228	5	3	3.0821 (−6)	3.6671 (−4)	6.5577 (2)
	0.4376	0.5644	7186	3	3	1.7224 (−6)	1.2224 (−4)	2.2251 (2)
	0.4376	0.5647	7168	3	1	2.3020 (−6)	1.6298 (−4)	8.9638 (2)
$a^3D^e \rightarrow r^3P^o$	1.3400 (−1)			15	9	3.4411 (−3)	1.1556	8.2721 (5)
	0.4398	0.5734	6822	7	5	3.4303 (−3)	5.3927 (−1)	6.8830 (5)
	0.4383	0.5734	6747	5	5	8.6708 (−4)	9.6299 (−2)	1.2704 (5)
	0.4376	0.5734	6710	3	5	9.6877 (−5)	6.4199 (−3)	8.6114 (3)
	0.4383	0.5724	6800	5	3	2.5812 (−3)	2.8890 (−1)	6.2065 (5)
	0.4376	0.5724	6762	3	3	1.4420 (−3)	9.6299 (−2)	2.1038 (5)
	0.4376	0.5719	6787	3	1	1.9154 (−3)	1.2840 (−1)	8.3199 (5)
$a^3D^e \rightarrow y^3D^o$	5.5261 (−2)			15	15	1.3463 (−1)	1.0964 (2)	3.3024 (6)
	0.4398	0.4944	16685	7	7	1.1822 (−1)	4.5462 (1)	2.8319 (6)
	0.4398	0.4939	16833	7	5	1.4695 (−2)	5.7010	4.8419 (5)
	0.4383	0.4944	16246	5	7	2.1318 (−2)	5.7010	3.8479 (5)
	0.4383	0.4939	16386	5	5	9.4298 (−2)	2.5435 (1)	2.3423 (6)
	0.4383	0.4938	16439	5	3	2.0257 (−2)	5.4818	8.3320 (5)
	0.4376	0.4939	16168	3	5	3.4328 (−2)	5.4818	5.2551 (5)
	0.4376	0.4938	16220	3	3	1.0266 (−1)	1.6445 (1)	2.6024 (6)
$a^3D^e \rightarrow x^3D^o$	9.9471 (−2)			15	15	9.5917 (−4)	4.3392 (−1)	7.6230 (4)
	0.4398	0.5387	9213	7	7	8.4740 (−4)	1.7993 (−1)	6.6576 (4)
	0.4398	0.5382	9266	7	5	1.0566 (−4)	2.2564 (−2)	1.1491 (4)
	0.4383	0.5387	9078	5	7	1.5100 (−4)	2.2564 (−2)	8.7292 (3)

continued

Table V(a). ***(continued)***

Si I

Transition	E_i (Ry)	E_f (Ry)	WL (Å)	g_i	g_f	f_{if}	S	a_{ji} (sec^{-1})
	0.4383	0.5382	9129	5	5	6.6993 (−4)	1.0067 (−1)	5.3617 (4)
	0.4383	0.5379	9149	5	3	1.4406 (−4)	2.1696 (−2)	1.9132 (4)
	0.4376	0.5382	9061	3	5	2.4244 (−4)	2.1696 (−2)	1.1818 (4)
	0.4376	0.5379	9081	3	3	7.2574 (−4)	6.5089 (−2)	5.8702 (4)
$a^3D^e \rightarrow w^3D^o$	1.2173 (−1)			15	15	1.9433 (−3)	7.1837 (−1)	2.3130 (5)
	0.4398	0.5611	7513	7	7	1.7205 (−3)	2.9788 (−1)	2.0330 (5)
	0.4398	0.5605	7549	7	5	2.1474 (−4)	3.7355 (−2)	3.5191 (4)
	0.4383	0.5611	7423	5	7	3.0574 (−4)	3.7355 (−2)	2.6439 (4)
	0.4383	0.5605	7457	5	5	1.3577 (−3)	1.6666 (−1)	1.6285 (5)
	0.4383	0.5600	7493	5	3	2.9120 (−4)	3.5918 (−2)	5.7653 (4)
	0.4376	0.5605	7412	3	5	4.9069 (−4)	3.5918 (−2)	3.5748 (4)
	0.4376	0.5600	7447	3	3	1.4650 (−3)	1.0776 (−1)	1.7618 (5)
$a^3D^e \rightarrow v^3D^o$	1.3413 (−1)			15	15	1.4345 (−3)	4.8128 (−1)	2.0729 (5)
	0.4398	0.5735	6816	7	7	1.2706 (−3)	1.9957 (−1)	1.8244 (5)
	0.4398	0.5734	6821	7	5	1.5922 (−4)	2.5027 (−2)	3.1957 (4)
	0.4383	0.5735	6741	5	7	2.2554 (−4)	2.5027 (−2)	2.3646 (4)
	0.4383	0.5734	6746	5	5	1.0055 (−3)	1.1166 (−1)	1.4737 (5)
	0.4383	0.5721	6815	5	3	2.1451 (−4)	2.4064 (−2)	5.1340 (4)
	0.4376	0.5734	6709	3	5	3.6318 (−4)	2.4064 (−2)	3.2293 (4)
	0.4376	0.5721	6777	3	3	1.0786 (−3)	7.2193 (−2)	1.5663 (5)
$a^3D^e \rightarrow u^3D^o$	1.4157 (−1)			15	15	9.7515 (−4)	3.0997 (−1)	1.5697 (5)
	0.4398	0.5810	6453	7	7	8.6430 (−4)	1.2853 (−1)	1.3843 (5)
	0.4398	0.5809	6457	7	5	1.0832 (−4)	1.6118 (−2)	2.4257 (4)
	0.4383	0.5810	6387	5	7	1.5333 (−4)	1.6118 (−2)	1.7911 (4)
	0.4383	0.5809	6391	5	5	6.8365 (−4)	7.1913 (−2)	1.1166 (5)
	0.4383	0.5793	6463	5	3	1.4569 (−4)	1.5499 (−2)	3.8774 (4)
	0.4376	0.5809	6357	3	5	2.4686 (−4)	1.5499 (−2)	2.4447 (4)
	0.4376	0.5793	6429	3	3	7.3230 (−4)	4.6496 (−2)	1.1819 (5)
$a^3D^e \rightarrow z^3F^o$	1.6443 (−2)			15	21	1.3986 (−1)	3.8276 (2)	2.1696 (5)
	0.4398	0.4561	55850	7	9	1.2740 (−1)	1.6404 (2)	2.1173 (5)
	0.4398	0.4550	59899	7	7	1.0297 (−2)	1.4217 (1)	1.9134 (4)
	0.4398	0.4543	63030	7	5	2.7592 (−4)	4.0099 (−1)	6.4785 (2)
	0.4383	0.4550	54601	5	7	1.2614 (−1)	1.1337 (2)	2.0160 (5)
	0.4383	0.4543	57192	5	5	1.5098 (−2)	1.4217 (1)	3.0775 (4)
	0.4376	0.4543	54622	3	5	1.4188 (−1)	7.6552 (1)	1.9023 (5)
$a^3D^e \rightarrow y^3F^o$	8.4999 (−2)			15	21	4.1249 (−1)	2.1838 (2)	1.7098 (7)
	0.4398	0.5247	10730	7	9	3.7847 (−1)	9.3592 (1)	1.7051 (7)
	0.4398	0.5235	10886	7	7	3.2333 (−2)	8.1113	1.8199 (6)
	0.4398	0.5228	10979	7	5	9.0412 (−4)	2.2878 (−1)	7.0023 (4)
	0.4383	0.5235	10697	5	7	3.6736 (−1)	6.4683 (1)	1.5296 (7)
	0.4383	0.5228	10788	5	5	4.5678 (−2)	8.1113	2.6179 (6)
	0.4376	0.5228	10693	3	5	4.1357 (−1)	4.3676 (1)	1.4475 (7)
$a^3D^e \rightarrow x^3F^o$	1.1474 (−1)			15	21	9.9982 (−2)	3.9212 (1)	7.5519 (6)
	0.4398	0.5545	7946	7	9	9.1772 (−2)	1.6805 (1)	7.5401 (6)
	0.4398	0.5532	8038	7	7	7.8627 (−3)	1.4564	8.1172 (5)
	0.4398	0.5526	8077	7	5	2.2069 (−4)	4.1079 (−2)	3.1588 (4)
	0.4383	0.5532	7935	5	7	8.8926 (−2)	1.1614 (1)	6.7298 (6)
	0.4383	0.5526	7972	5	5	1.1098 (−2)	1.4564	1.1646 (6)
	0.4376	0.5526	7921	3	5	1.0025 (−1)	7.8424	6.3952 (6)
$a^3D^e \rightarrow v^3F^o$	1.3010 (−1)			15	21	3.9578 (−2)	1.3690 (1)	3.8432 (6)
	0.4398	0.5698	7008	7	9	3.6329 (−2)	5.8672	3.8374 (6)
	0.4398	0.5684	7086	7	7	3.1139 (−3)	5.0849 (−1)	4.1364 (5)
	0.4398	0.5682	7099	7	5	8.7657 (−5)	1.4342 (−2)	1.6238 (4)
	0.4383	0.5684	7006	5	7	3.5164 (−2)	4.0549	3.4137 (6)
	0.4383	0.5682	7019	5	5	4.4012 (−3)	5.0849 (−1)	5.9587 (5)
	0.4376	0.5682	6978	3	5	3.9726 (−2)	2.7380	3.2645 (6)
$a^3D^e \rightarrow t^3F^o$	1.3871 (−1)			15	21	2.0179 (−2)	6.5467	2.2275 (6)
	0.4398	0.5788	6557	7	9	1.8567 (−2)	2.8057	2.2402 (6)
	0.4398	0.5772	6633	7	7	1.5907 (−3)	2.4316 (−1)	2.4115 (5)
	0.4398	0.5760	6693	7	5	4.4465 (−5)	6.8584 (−3)	9.2688 (3)

Table V(a). ***(continued)***

Transition	Si I E_i (Ry)	E_f (Ry)	WL (Å)	g_i	g_f	f_{if}	S	a_{ji} (sec^{-1})
	0.4383	0.5772	6562	5	7	1.7951 (−2)	1.9391	1.9858 (6)
	0.4383	0.5760	6621	5	5	2.2311 (−3)	2.4316 (−1)	3.3945 (5)
	0.4376	0.5760	6586	3	5	2.0132 (−2)	1.3093	1.8579 (6)
$a^3D^e \rightarrow r^3F^o$	1.4438 (−1)			15	21	1.1880 (−2)	3.7025	1.4209 (6)
	0.4398	0.5844	6301	7	9	1.0927 (−2)	1.5868	1.4275 (6)
	0.4398	0.5827	6377	7	7	9.3574 (−4)	1.3752 (−1)	1.5346 (5)
	0.4398	0.5819	6412	7	5	1.6250 (−5)	3.8788 (−3)	5.9622 (3)
	0.4383	0.5827	6312	5	7	1.0555 (−2)	1.0966	1.2622 (6)
	0.4383	0.5819	6346	5	5	1.3165 (−3)	1.3752 (−1)	2.1806 (5)
	0.4376	0.5819	6313	3	5	1.1877 (−2)	7.4050 (−1)	1.1927 (6)
$a^3D^e \rightarrow p^3F^o$	1.4808 (−1)			15	21	7.6615 (−3)	2.3283	9.6383 (5)
	0.4398	0.5882	6140	7	9	7.0519 (−3)	9.9784 (−1)	9.7034 (5)
	0.4398	0.5864	6216	7	7	6.0371 (−4)	8.6479 (−2)	1.0422 (5)
	0.4398	0.5854	6258	7	5	1.6913 (−5)	2.4392 (−3)	4.0324 (3)
	0.4383	0.5864	6154	5	7	6.8079 (−3)	6.8962 (−1)	8.5647 (5)
	0.4383	0.5854	6195	5	5	8.4802 (−4)	8.6479 (−2)	1.4737 (5)
	0.4376	0.5854	6164	3	5	7.6492 (−3)	4.6566 (−1)	8.0573 (5)
$b^3D^e \rightarrow v^3P^o$	2.0986 (−2)			15	9	3.5656 (−1)	7.6456 (2)	2.1022 (6)
	0.5212	0.5423	43325	7	5	3.5731 (−1)	3.5680 (2)	1.7770 (6)
	0.5196	0.5423	40182	5	5	9.6335 (−2)	6.3714 (1)	3.9802 (5)
	0.5192	0.5423	39558	3	5	1.0874 (−2)	4.2476	2.7818 (4)
	0.5196	0.5401	44330	5	3	2.6199 (−1)	1.9114 (2)	1.4826 (6)
	0.5192	0.5401	43573	3	3	1.4810 (−1)	6.3714 (1)	5.2061 (5)
	0.5192	0.5397	44593	3	1	1.9293 (−1)	8.4951 (1)	1.9424 (6)
$b^3D^e \rightarrow u^3P^o$	2.6138 (−2)			15	9	9.8800 (−3)	1.7024 (1)	9.0433 (4)
	0.5212	0.5460	36774	7	5	9.3744 (−3)	7.9444	6.4731 (4)
	0.5196	0.5460	34484	5	5	2.4997 (−3)	1.4186	1.4025 (4)
	0.5192	0.5460	34024	3	5	2.8152 (−4)	9.4576 (−2)	9.7375 (2)
	0.5196	0.5468	33416	5	3	7.7373 (−3)	4.2559	7.7027 (4)
	0.5192	0.5468	32983	3	3	4.3552 (−3)	1.4186	2.6706 (4)
	0.5192	0.5471	32635	3	1	5.8700 (−3)	1.8915	1.1034 (5)
$b^3D^e \rightarrow t^3P^o$	4.2117 (−2)			15	9	3.3073 (−2)	3.5337 (1)	7.8538 (5)
	0.5212	0.5634	21620	7	5	3.3099 (−2)	1.6491 (1)	6.6126 (5)
	0.5196	0.5634	20808	5	5	8.5986 (−3)	2.9447	1.3250 (5)
	0.5192	0.5634	20639	3	5	9.6326 (−4)	1.9632 (−1)	9.0529 (3)
	0.5196	0.5613	21847	5	3	2.4565 (−2)	8.8342	5.7211 (5)
	0.5192	0.5613	21661	3	3	1.3765 (−2)	2.9447	1.9569 (5)
	0.5192	0.5608	21921	3	1	1.8135 (−2)	3.9263	7.5516 (5)
$b^3D^e \rightarrow s^3P^o$	4.3706 (−2)			15	9	2.0355 (−4)	2.0958 (−1)	5.2052 (3)
	0.5212	0.5636	21515	7	5	1.9723 (−4)	9.7802 (−2)	3.9779 (3)
	0.5196	0.5636	20711	5	5	5.1230 (−5)	1.7465 (−2)	7.9664 (2)
	0.5192	0.5636	20544	3	5	5.7388 (−6)	1.1643 (−3)	5.4424 (1)
	0.5196	0.5644	20328	5	3	1.5659 (−4)	5.2394 (−2)	4.2129 (3)
	0.5192	0.5644	20167	3	3	8.7692 (−5)	1.7465 (−2)	1.4384 (3)
	0.5192	0.5647	20032	3	1	1.1770 (−4)	2.3286 (−2)	5.8690 (3)
$b^3D^e \rightarrow r^3P^o$	5.2604 (−2)			15	9	1.0501 (−2)	8.9831	3.8900 (5)
	0.5212	0.5734	17465	7	5	1.0414 (−2)	4.1921	3.1874 (5)
	0.5196	0.5734	16931	5	5	2.6859 (−3)	7.4859 (−1)	6.2491 (4)
	0.5192	0.5734	16819	3	5	3.0043 (−4)	4.9906 (−2)	4.2502 (3)
	0.5196	0.5724	17267	5	3	7.9021 (−3)	2.2458	2.9469 (5)
	0.5192	0.5724	17151	3	3	4.4200 (−3)	7.4859 (−1)	1.0025 (5)
	0.5192	0.5719	17317	3	1	5.8368 (−3)	9.9812 (−1)	3.8958 (5)
$b^3D^e \rightarrow x^3D^o$	1.8072 (−2)			15	15	1.9291 (−1)	4.8035 (2)	5.0609 (5)
	0.5212	0.5387	52083	7	7	1.6589 (−1)	1.9918 (2)	4.0761 (5)
	0.5212	0.5382	53807	7	5	2.0137 (−2)	2.4978 (1)	6.4905 (4)
	0.5196	0.5387	47607	5	7	3.1872 (−2)	2.4978 (1)	6.6989 (4)
	0.5196	0.5382	49043	5	5	1.3804 (−1)	1.1144 (2)	3.8276 (5)
	0.5196	0.5379	49635	5	3	2.9397 (−2)	2.4017 (1)	1.3266 (5)

continued

Table V(a). ***(continued)***

Si I

Transition	E_i (Ry)	E_f (Ry)	WL (Å)	g_i	g_f	f_{if}	S	a_{ji} (sec^{-1})
	0.5192	0.5382	48117	3	5	5.0543 (−2)	2.4017 (1)	8.7380 (4)
	0.5192	0.5379	48687	3	3	1.4987 (−1)	7.2052 (1)	4.2185 (5)
$b^3D^e \rightarrow w^3D^o$	4.0333 (−2)			15	15	4.3104 (−5)	4.8092 (−2)	5.6320 (2)
	0.5212	0.5611	22848	7	7	3.7871 (−5)	1.9942 (−2)	4.8378 (2)
	0.5212	0.5605	23182	7	5	4.6812 (−6)	2.5008 (−3)	8.1344 (1)
	0.5196	0.5611	21943	5	7	6.9238 (−6)	2.5008 (−3)	6.8513 (1)
	0.5196	0.5605	22251	5	5	3.0467 (−5)	1.1157 (−2)	4.1057 (2)
	0.5196	0.5600	22572	5	3	6.4715 (−6)	2.4046 (−3)	1.4119 (2)
	0.5192	0.5605	22058	3	5	1.1040 (−5)	2.4046 (−3)	9.0838 (1)
	0.5192	0.5600	22373	3	3	3.2646 (−5)	7.2137 (−3)	4.3501 (2)
$b^3D^e \rightarrow v^3D^o$	5.2730 (−2)			15	15	6.9489 (−4)	5.9302 (−1)	1.5519 (4)
	0.5212	0.5735	17427	7	7	6.1231 (−4)	2.4591 (−1)	1.3448 (4)
	0.5212	0.5734	17459	7	5	7.6638 (−5)	3.0837 (−2)	2.3474 (3)
	0.5196	0.5735	16896	5	7	1.1089 (−4)	3.0837 (−2)	1.8511 (3)
	0.5196	0.5734	16925	5	5	4.9383 (−4)	1.3758 (−1)	1.1498 (4)
	0.5196	0.5721	17369	5	3	1.0372 (−4)	2.9651 (−2)	3.8227 (3)
	0.5192	0.5734	16814	3	5	1.7857 (−4)	2.9651 (−2)	2.5280 (3)
	0.5192	0.5721	17251	3	3	5.2216 (−4)	8.8953 (−2)	1.1706 (4)
$b^3D^e \rightarrow u^3D^o$	6.0169 (−2)			15	15	6.6107 (−4)	4.9441 (−1)	1.9223 (4)
	0.5212	0.5810	15239	7	7	5.8381 (−4)	2.0502 (−1)	1.6769 (4)
	0.5212	0.5809	15262	7	5	7.3101 (−5)	2.5710 (−2)	2.9308 (3)
	0.5196	0.5810	14831	5	7	1.0532 (−4)	2.5710 (−2)	2.2818 (3)
	0.5196	0.5809	14852	5	5	4.6922 (−4)	1.1470 (−1)	1.4190 (4)
	0.5196	0.5793	15249	5	3	9.8487 (−5)	2.4721 (−2)	4.7085 (3)
	0.5192	0.5809	14766	3	5	1.6953 (−4)	2.4721 (−2)	3.1123 (3)
	0.5192	0.5793	15158	3	3	4.9540 (−4)	7.4162 (−2)	1.4382 (4)
$b^3D^e \rightarrow y^3F^o$	3.6002 (−3)			15	21	1.7949 (−1)	2.2435 (3)	1.3348 (4)
	0.5212	0.5247	259316	7	9	1.6071 (−1)	9.6152 (2)	1.2369 (4)
	0.5212	0.5235	395956	7	7	9.1268 (−3)	8.3332 (1)	3.8780 (2)
	0.5212	0.5228	573822	7	5	1.7684 (−4)	2.3504	4.9643
	0.5196	0.5235	230902	5	7	1.7499 (−1)	6.6452 (2)	1.5664 (4)
	0.5196	0.5228	281848	5	5	1.7944 (−2)	8.3332 (1)	1.5037 (3)
	0.5192	0.5228	253781	3	5	1.7898 (−1)	4.4871 (2)	1.1117 (4)
$b^3D^e \rightarrow x^3F^o$	3.3341 (−2)			15	21	4.1985 (−1)	5.6667 (2)	2.6777 (6)
	0.5212	0.5545	27390	7	9	3.8476 (−1)	2.4286 (2)	2.6606 (6)
	0.5212	0.5532	28511	7	7	3.2032 (−2)	2.1048 (1)	2.6281 (5)
	0.5212	0.5526	29007	7	5	8.8793 (−4)	5.9365 (−1)	9.8510 (3)
	0.5196	0.5532	27115	5	7	3.7608 (−1)	1.6784 (2)	2.4374 (6)
	0.5196	0.5526	27564	5	5	4.6389 (−2)	2.1048 (1)	4.0725 (5)
	0.5192	0.5526	27269	3	5	4.2084 (−1)	1.1333 (2)	2.2653 (6)
$b^3D^e \rightarrow v^3F^o$	4.8697 (−2)			15	21	1.1003 (−1)	1.0167 (2)	1.4970 (6)
	0.5212	0.5698	18740	7	9	1.0089 (−1)	4.3574 (1)	1.4899 (6)
	0.5212	0.5684	19310	7	7	8.4862 (−3)	3.7764	1.5179 (5)
	0.5212	0.5682	19410	7	5	2.3809 (−4)	1.0652 (−1)	5.8991 (3)
	0.5196	0.5684	18659	5	7	9.8054 (−2)	3.0115 (1)	1.3419 (6)
	0.5196	0.5682	18753	5	5	1.2233 (−2)	3.7764	2.3199 (5)
	0.5192	0.5682	18616	3	5	1.1060 (−1)	2.0335 (1)	1.2771 (6)
$b^3D^e \rightarrow t^3F^o$	5.7309 (−2)			15	21	4.6950 (−2)	3.6866 (1)	8.8470 (5)
	0.5212	0.5788	15832	7	9	4.3306 (−2)	1.5800 (1)	8.9636 (5)
	0.5212	0.5772	16280	7	7	3.6495 (−3)	1.3693	9.1830 (4)
	0.5212	0.5760	16648	7	5	1.0067 (−4)	3.8621 (−2)	3.3923 (3)
	0.5196	0.5772	15815	5	7	4.1945 (−2)	1.0919 (1)	7.9898 (5)
	0.5196	0.5760	16162	5	5	5.1477 (−3)	1.3693	1.3148 (5)
	0.5192	0.5760	16060	3	5	4.6492 (−2)	7.3732	7.2160 (5)
$b^3D^e \rightarrow r^3F^o$	6.2987 (−2)			15	21	2.5195 (−2)	1.8000 (1)	5.7347 (5)
	0.5212	0.5844	14418	7	9	2.3216 (−2)	7.7143	5.7932 (5)
	0.5212	0.5827	14821	7	7	1.9573 (−3)	6.6857 (−1)	5.9425 (4)
	0.5212	0.5819	15010	7	5	5.4515 (−5)	1.8857 (−2)	2.2594 (3)
	0.5196	0.5827	14435	5	7	2.2438 (−2)	5.3314	5.1306 (5)

Table V(a). ***(continued)***

S I I

Transition	E_i (Ry)	E_f (Ry)	WL (Å)	g_i	g_f	f_{if}	S	a_{ji} (sec^{-1})
	0.5196	0.5819	14614	5	5	2.7795 (−3)	6.6857 (−1)	8.6818 (4)
	0.5192	0.5819	14530	3	5	2.5088 (−2)	3.6000	4.7563 (5)
$b^3D^e \rightarrow p^3F^o$	6.6679 (−2)			15	21	1.5354 (−2)	1.0362 (1)	3.9167 (5)
	0.5212	0.5882	13601	7	9	1.4169 (−2)	4.4410	3.9735 (5)
	0.5212	0.5864	13978	7	7	1.1948 (−3)	3.8488 (−1)	4.0784 (4)
	0.5212	0.5854	14194	7	5	3.3187 (−5)	1.0856 (−2)	1.5382 (3)
	0.5196	0.5864	13634	5	7	1.3676 (−2)	3.0692	3.5055 (5)
	0.5196	0.5854	13839	5	5	1.6896 (−3)	3.8488 (−1)	5.8849 (4)
	0.5192	0.5854	13765	3	5	1.5246 (−2)	2.0724	3.2211 (5)
$z^3D^o \rightarrow b^3P^e$	3.4854 (−2)			15	9	3.2660 (−2)	4.2167 (1)	5.3115 (5)
	0.4130	0.4482	25861	7	5	3.3021 (−2)	1.9678 (1)	4.6114 (5)
	0.4128	0.4482	25674	5	5	8.3139 (−3)	3.5139	8.4111 (4)
	0.4126	0.4482	25560	3	5	9.2793 (−4)	2.3426 (−1)	5.6836 (3)
	0.4128	0.4471	26547	5	3	2.4119 (−2)	1.0542 (1)	3.8032 (5)
	0.4126	0.4471	26424	3	3	1.3462 (−2)	3.5139	1.2855 (5)
	0.4126	0.4468	26652	3	1	1.7799 (−2)	4.6852	5.0135 (5)
$z^3D^o \rightarrow c^3P^e$	1.1026 (−1)			15	9	3.1528 (−3)	1.2868	5.1309 (5)
	0.4130	0.5237	8233	7	5	3.1652 (−3)	6.0049 (−1)	4.3609 (5)
	0.4128	0.5237	8214	5	5	7.9308 (−4)	1.0723 (−1)	7.8402 (4)
	0.4126	0.5237	8202	3	5	8.8247 (−5)	7.1487 (−3)	5.2495 (3)
	0.4128	0.5224	8309	5	3	2.3520 (−3)	3.2169 (−1)	3.7870 (5)
	0.4126	0.5224	8297	3	3	1.3086 (−3)	1.0723 (−1)	1.2679 (5)
	0.4126	0.5221	8320	3	1	1.7400 (−3)	1.4297 (−1)	5.0301 (5)
$z^3D^o \rightarrow a^3D^e$	2.6045 (−2)			15	15	9.3944 (−3)	1.6231 (1)	5.1188 (4)
	0.4130	0.4398	33985	7	7	8.5958 (−3)	6.7305	4.9664 (4)
	0.4130	0.4383	35965	7	5	1.0185 (−3)	8.4402 (−1)	7.3539 (3)
	0.4128	0.4398	33663	5	7	1.5232 (−3)	8.4402 (−1)	6.4038 (3)
	0.4128	0.4383	35604	5	5	6.4242 (−3)	3.7656	3.3790 (4)
	0.4128	0.4376	36678	5	3	1.3439 (−3)	8.1156 (−1)	1.1101 (4)
	0.4126	0.4383	35384	3	5	2.3220 (−3)	8.1156 (−1)	7.4199 (3)
	0.4126	0.4376	36445	3	3	6.7630 (−3)	2.4347	3.3951 (4)
$z^3D^o \rightarrow b^3D^e$	1.0744 (−1)			15	15	5.2375 (−4)	2.1936 (−1)	4.8565 (4)
	0.4130	0.5212	8420	7	7	4.6879 (−4)	9.0961 (−2)	4.4108 (4)
	0.4130	0.5196	8550	7	5	5.7892 (−5)	1.1407 (−2)	7.3949 (3)
	0.4128	0.5212	8400	5	7	8.2493 (−5)	1.1407 (−2)	5.5696 (3)
	0.4128	0.5196	8530	5	5	3.6245 (−4)	5.0891 (−2)	3.3225 (4)
	0.4128	0.5192	8558	5	3	7.7850 (−5)	1.0968 (−2)	1.1814 (4)
	0.4126	0.5196	8517	3	5	1.3038 (−4)	1.0968 (−2)	7.1928 (3)
	0.4126	0.5192	8545	3	3	3.8984 (−4)	3.2904 (−2)	3.5602 (4)
$y^3D^o \rightarrow c^3P^e$	2.8951 (−2)			15	9	9.7966 (−2)	1.5228 (2)	1.0992 (6)
	0.4944	0.5237	31146	7	5	9.9013 (−2)	7.1062 (1)	9.5324 (5)
	0.4939	0.5237	30645	5	5	2.5159 (−2)	1.2690 (1)	1.7874 (5)
	0.4938	0.5237	30460	3	5	2.8124 (−3)	8.4597 (−1)	1.2134 (4)
	0.4939	0.5224	32013	5	3	7.2255 (−2)	3.8069 (1)	7.8402 (5)
	0.4938	0.5224	31811	3	3	4.0395 (−2)	1.2690 (1)	2.6633 (5)
	0.4938	0.5221	32148	3	1	5.3296 (−2)	1.6919 (1)	1.0322 (6)
$y^3D^o \rightarrow b^3D^e$	2.6138 (−2)			15	15	3.8513 (−2)	6.6306 (1)	2.1134 (5)
	0.4944	0.5212	34008	7	7	3.5088 (−2)	2.7495 (1)	2.0243 (5)
	0.4944	0.5196	36233	7	5	4.1293 (−3)	3.4479	2.9371 (4)
	0.4939	0.5212	33412	5	7	6.2706 (−3)	3.4479	2.6773 (4)
	0.4939	0.5196	35557	5	5	2.6284 (−2)	1.5383 (1)	1.3868 (5)
	0.4939	0.5192	36060	5	3	5.5851 (−3)	3.3153	4.7745 (4)
	0.4938	0.5196	35308	3	5	9.5075 (−3)	3.3153	3.0523 (4)
	0.4938	0.5192	35804	3	3	2.8125 (−2)	9.9458	1.4632 (5)
$z^3F^o \rightarrow b^3D^e$	6.4955 (−2)			21	15	1.1566 (−2)	1.1218 (1)	5.4874 (5)
	0.4561	0.5212	13999	9	7	1.1592 (−2)	4.8076	5.0733 (5)
	0.4550	0.5212	13766	7	7	1.3135 (−3)	4.1666 (−1)	4.6235 (4)
	0.4543	0.5212	13611	5	7	5.2461 (−5)	1.1752 (−2)	1.3495 (3)
	0.4550	0.5196	14117	7	5	1.0213 (−2)	3.3226	4.7853 (5)
	0.4543	0.5196	13953	5	5	1.8141 (−3)	4.1666 (−1)	6.2153 (4)
	0.4543	0.5192	14030	5	3	9.7146 (−3)	2.2435	5.4861 (5)

Table V(b). ***f- and A-values for S III***

S III

Transition	E_i (Ry)	E_f (Ry)	WL (Å)	g_i	g_f	f_{if}	S	a_{ji} (sec^{-1})
$a^1S^e \rightarrow z^1P^o$	0.2475	1.2470	912	1	3	2.2255 (−3)	6.6798 (−3)	5.9524 (6)
$a^1S^e \rightarrow y^1P^o$	0.2475	1.3523	825	1	3	6.6156 (−2)	1.7964 (−1)	2.1620 (8)
$a^1S^e \rightarrow x^1P^o$	0.2475	1.4958	730	1	3	2.6474	6.3625	1.1045 (10)
$a^1S^e \rightarrow w^1P^o$	0.2475	1.9258	543	1	3	5.5762 (−2)	9.9677 (−2)	4.2052 (8)
$a^1S^e \rightarrow v^1P^o$	0.2475	1.9459	537	1	3	1.6975 (−1)	2.9984 (−1)	1.3110 (9)
$b^1S^e \rightarrow w^1P^o$	1.6654	1.9258	3500	1	3	2.6945 (−1)	3.1042	4.8918 (7)
$b^1S^e \rightarrow v^1P^o$	1.6654	1.9459	3249	1	3	1.0330	1.1048 (1)	2.1761 (8)
$a^1P^e \rightarrow w^1P^o$	1.5269	1.9258	2284	3	3	1.4281 (−1)	3.2222	1.8253 (8)
$a^1P^e \rightarrow v^1P^o$	1.5269	1.9459	2174	3	3	2.3185 (−1)	4.9802	3.2695 (8)
$a^1P^e \rightarrow x^1D^o$	1.5269	1.8694	2660	3	5	7.8965 (−1)	2.0750 (1)	4.4642 (8)
$z^1P^o \rightarrow b^1S^e$	1.2470	1.6654	2178	3	1	7.1949 (−2)	1.5477	3.0350 (8)
$z^1P^o \rightarrow a^1P^e$	1.2470	1.5269	3256	3	3	1.5072 (−3)	4.8464 (−2)	9.4847 (5)
$z^1P^o \rightarrow b^1D^e$	1.2470	1.6128	2491	3	5	6.0640 (−2)	1.4920	3.9105 (7)
$y^1P^o \rightarrow b^1S^e$	1.3523	1.6654	2910	3	1	8.0026 (−2)	2.3003	1.8904 (8)
$y^1P^o \rightarrow a^1P^e$	1.3523	1.5269	5221	3	3	2.8700 (−1)	1.4794 (1)	7.0276 (7)
$y^1P^o \rightarrow b^1D^e$	1.3523	1.6128	3498	3	5	5.6460 (−1)	1.9506 (1)	1.8465 (8)
$x^1P^o \rightarrow b^1S^e$	1.4958	1.6654	5371	3	1	7.7858 (−2)	4.1316	5.3965 (7)
$x^1P^o \rightarrow b^1D^e$	1.4958	1.6128	7786	3	5	1.1593 (−2)	8.9178 (−1)	7.6482 (5)
$a^1D^e \rightarrow z^1P^o$	0.1032	1.2470	797	5	3	3.6960 (−1)	4.8469	6.4734 (9)
$a^1D^e \rightarrow y^1P^o$	0.1032	1.3523	730	5	3	9.3050 (−2)	1.1174	1.9436 (9)
$a^1D^e \rightarrow x^1P^o$	0.1032	1.4958	654	5	3	2.3617 (−2)	2.5438 (−1)	6.1316 (8)
$a^1D^e \rightarrow w^1P^o$	0.1032	1.9258	500	5	3	2.6074 (−2)	2.1459 (−1)	1.1596 (9)
$a^1D^e \rightarrow v^1P^o$	0.1032	1.9459	495	5	3	6.2091 (−4)	5.0543 (−3)	2.8225 (7)
$a^1D^e \rightarrow z^1D^o$	0.1032	0.9492	1077	5	5	2.1565 (−2)	3.8237 (−1)	1.2397 (8)
$a^1D^e \rightarrow y^1D^o$	0.1032	1.3849	711	5	5	9.9367 (−1)	1.1629 (1)	1.3112 (10)
$a^1D^e \rightarrow x^1D^o$	0.1032	1.8694	516	5	5	2.4756 (−2)	2.1025 (−1)	6.2032 (8)
$a^1D^e \rightarrow z^1F^o$	0.1032	1.4362	684	5	7	1.3419	1.5100 (1)	1.3680 (10)
$a^1D^e \rightarrow y^1F^o$	0.1032	1.9241	500	5	7	8.7483 (−2)	7.2065 (−1)	1.6642 (9)
$b^1D^e \rightarrow w^1P^o$	1.6128	1.9258	2912	5	3	2.1742 (−1)	1.0419 (1)	2.8514 (8)
$b^1D^e \rightarrow v^1P^o$	1.6128	1.9459	2735	5	3	9.5199 (−3)	4.2870 (−1)	1.4141 (7)
$b^1D^e \rightarrow x^1D^o$	1.6128	1.8694	3551	5	5	1.4237 (−1)	8.3223	7.5294 (7)
$b^1D^e \rightarrow y^1F^o$	1.6128	1.9241	2927	5	7	8.4227 (−1)	4.0585 (1)	4.6830 (8)
$z^1D^o \rightarrow a^1P^e$	0.9492	1.5269	1577	5	3	7.0623 (−2)	1.8336	3.1557 (8)
$z^1D^o \rightarrow b^1D^e$	0.9492	1.6128	1373	5	5	2.6060 (−2)	5.8902 (−1)	9.2188 (7)
$y^1D^o \rightarrow a^1P^e$	1.3849	1.5269	6421	5	3	2.7757 (−2)	2.9321	7.4928 (6)
$y^1D^o \rightarrow b^1D^e$	1.3849	1.6128	3999	5	5	1.6998 (−2)	1.1188	7.0912 (6)
$z^1F^o \rightarrow b^1D^e$	1.4362	1.6128	5162	7	5	1.1407 (−1)	1.3564 (1)	4.0004 (7)
$a^3S^e \rightarrow w^3P^o$	3.0948 (−1)			3	9	9.1937 (−1)	2.6736 (1)	2.3576 (8)
	1.5860	1.8945	2954	3	5	5.0915 (−1)	1.4854 (1)	2.3353 (8)
	1.5860	1.8964	2935	3	3	3.0737 (−1)	8.9121	2.3787 (8)
	1.5860	1.8974	2926	3	1	1.0279 (−1)	2.9707	2.4018 (8)
$a^3S^e \rightarrow v^3P^o$	3.3080 (−1)			3	9	3.3611 (−1)	9.1443	9.8478 (7)
	1.5860	1.9200	2728	3	5	1.8853 (−1)	5.0802	1.0136 (8)
	1.5860	1.9130	2786	3	3	1.1075 (−1)	3.0481	9.5119 (7)
	1.5860	1.9116	2798	3	1	3.6758 (−2)	1.0160	9.3902 (7)
$z^3S^o \rightarrow b^3P^e$	3.1830 (−1)			3	9	9.1985 (−5)	2.6009 (−3)	2.4952 (4)
	1.2582	1.5783	2847	3	5	5.1392 (−5)	1.4449 (−3)	2.5378 (4)
	1.2582	1.5746	2880	3	3	3.0479 (−5)	8.6697 (−4)	2.4508 (4)
	1.2582	1.5731	2893	3	1	1.0111 (−5)	2.8899 (−4)	2.4161 (4)
$a^3P^e \rightarrow z^3S^o$	1.2530			9	3	3.4774 (−1)	7.4931	1.3156 (10)
	0.0076	1.2582	729	5	3	3.4707 (−1)	4.1628	7.2668 (9)
	0.0027	1.2582	726	3	3	3.4842 (−1)	2.4977	4.4112 (9)
	0.0000	1.2582	724	1	3	3.4918 (−1)	8.3256 (−1)	1.4800 (9)
$a^3P^e \rightarrow z^3P^o$	8.9480 (−1)			9	9	4.2526 (−2)	1.2832	2.7349 (8)
	0.0076	0.8998	1021	5	5	3.1804 (−2)	5.3467 (−1)	2.0337 (8)
	0.0076	0.9000	1021	5	3	1.0603 (−2)	1.7822 (−1)	1.1305 (8)
	0.0027	0.8998	1016	3	5	1.7765 (−2)	1.7822 (−1)	6.8906 (7)
	0.0027	0.9000	1016	3	3	1.0661 (−2)	1.0693 (−1)	6.8948 (7)
	0.0027	0.9001	1015	3	1	1.4216 (−2)	1.4258 (−1)	2.7585 (8)
	0.0000	0.9000	1012	1	3	4.2774 (−2)	1.4258 (−1)	9.2769 (7)

Table V(b). ***(continued)***

S III

Transition	E_i (Ry)	E_t (Ry)	WL (Å)	g_i	g_t	f_{it}	S	a_{ji} (sec^{-1})
$a^3P^e \rightarrow y^3P^o$	1.2991			9	9	7.7086 (−1)	1.6022 (1)	1.0449 (10)
	0.0076	1.3042	703	5	5	5.7705 (−1)	6.6757	7.7923 (9)
	0.0076	1.3042	703	5	3	1.9235 (−1)	2.2252	4.3291 (9)
	0.0027	1.3042	700	3	5	3.2179 (−1)	2.2252	2.6268 (9)
	0.0027	1.3042	700	3	3	1.9307 (−1)	1.3351	2.6268 (9)
	0.0027	1.3040	700	3	1	2.5739 (−1)	1.7802	1.0502 (10)
	0.0000	1.3042	699	1	3	7.7391 (−1)	1.7802	3.5245 (9)
$a^3P^e \rightarrow x^3P^o$	1.3341			9	9	8.6062 (−2)	1.7418	1.2303 (9)
	0.0076	1.3409	683	5	5	6.4509 (−2)	7.2574 (−1)	9.2113 (8)
	0.0076	1.3372	685	5	3	2.1443 (−2)	2.4191 (−1)	5.0749 (8)
	0.0027	1.3409	681	3	5	3.5969 (−2)	2.4191 (−1)	3.1042 (8)
	0.0027	1.3372	683	3	3	2.1522 (−2)	1.4515 (−1)	3.0785 (8)
	0.0027	1.3368	683	3	1	2.8687 (−2)	1.9353 (−1)	1.2303 (9)
	0.0000	1.3372	681	1	3	8.6263 (−2)	1.9353 (−1)	4.1299 (8)
$a^3P^e \rightarrow w^3P^o$	1.8903			9	9	2.2834 (−2)	3.2615 (−1)	6.5538 (8)
	0.0076	1.8945	483	5	5	1.7095 (−2)	1.3590 (−1)	4.8889 (8)
	0.0076	1.8964	482	5	3	5.7041 (−3)	4.5299 (−2)	2.7243 (8)
	0.0027	1.8945	482	3	5	9.5218 (−3)	4.5299 (−2)	1.6423 (8)
	0.0027	1.8964	481	3	3	5.7188 (−3)	2.7179 (−2)	1.6472 (8)
	0.0027	1.8974	481	3	1	7.6291 (−3)	3.6239 (−2)	6.5994 (8)
	0.0000	1.8964	481	1	3	2.2908 (−2)	3.6239 (−2)	2.2058 (8)
$a^3P^e \rightarrow v^3P^o$	1.9116			9	9	2.0040 (−2)	2.8305 (−1)	5.8822 (8)
	0.0076	1.9200	476	5	5	1.5036 (−2)	1.1794 (−1)	4.4170 (8)
	0.0076	1.9130	478	5	3	4.9937 (−3)	3.9312 (−2)	2.4271 (8)
	0.0027	1.9200	475	3	5	8.3746 (−3)	3.9312 (−2)	1.4836 (8)
	0.0027	1.9130	477	3	3	5.0064 (−3)	2.3587 (−2)	1.4674 (8)
	0.0027	1.9116	477	3	1	6.6704 (−3)	3.1449 (−2)	5.8569 (8)
	0.0000	1.9130	476	1	3	2.0054 (−2)	3.1449 (−2)	1.9650 (8)
$a^3P^e \rightarrow z^3D^o$	7.6094 (−1)			9	15	2.4566 (−2)	8.7164 (−1)	6.8552 (7)
	0.0076	0.7664	1201	5	7	2.0576 (−2)	4.0677 (−1)	6.7968 (7)
	0.0076	0.7659	1202	5	5	3.6721 (−3)	7.2637 (−2)	1.6961 (7)
	0.0076	0.7656	1202	5	3	2.4472 (−4)	4.8425 (−3)	1.8826 (6)
	0.0027	0.7659	1194	3	5	1.8478 (−2)	2.1791 (−1)	5.1869 (7)
	0.0027	0.7656	1194	3	3	6.1574 (−3)	7.2637 (−2)	2.8786 (7)
	0.0000	0.7656	1190	1	3	2.4717 (−2)	9.6849 (−2)	3.8794 (7)
$a^3P^e \rightarrow y^3D^o$	1.3407			9	15	1.6373	3.2973 (1)	1.4184 (10)
	0.0076	1.3464	681	5	7	1.3734	1.5387 (1)	1.4123 (10)
	0.0076	1.3459	681	5	5	2.4515 (−1)	2.7477	3.5268 (9)
	0.0076	1.3446	682	5	3	1.6328 (−2)	1.8318 (−1)	3.9073 (8)
	0.0027	1.3459	678	3	5	1.2302	8.2431	1.0696 (10)
	0.0027	1.3446	679	3	3	4.0968 (−1)	2.7477	5.9252 (9)
	0.0000	1.3446	678	1	3	1.6420	3.6636	7.9485 (9)
$a^3P^e \rightarrow x^3D^o$	1.8790			9	15	5.8170 (−2)	8.3587 (−1)	9.8979 (8)
	0.0076	1.8855	485	5	7	4.8835 (−2)	3.9007 (−1)	9.8807 (8)
	0.0076	1.8833	486	5	5	8.7103 (−3)	6.9656 (−2)	2.4615 (8)
	0.0076	1.8821	486	5	3	5.8031 (−4)	4.6437 (−3)	2.7297 (7)
	0.0027	1.8833	485	3	5	4.3664 (−2)	2.0897 (−1)	7.4422 (8)
	0.0027	1.8821	485	3	3	1.4546 (−2)	6.9656 (−2)	4.1266 (8)
	0.0000	1.8821	484	1	3	5.8266 (−2)	9.2874 (−2)	5.5261 (8)
$b^3P^e \rightarrow w^3P^o$	3.1898 (−1)			9	9	3.2047 (−1)	2.7126 (1)	2.6190 (8)
	1.5783	1.8945	2882	5	5	2.3826 (−1)	1.1303 (1)	1.9134 (8)
	1.5783	1.8964	2864	5	3	7.9898 (−2)	3.7676	1.0823 (8)
	1.5746	1.8945	2849	3	5	1.3392 (−1)	3.7676	6.6046 (7)
	1.5746	1.8964	2831	3	3	8.0827 (−2)	2.2605	6.7230 (7)
	1.5746	1.8974	2823	3	1	1.0810 (−1)	3.0141	2.7144 (8)
	1.5731	1.8964	2819	1	3	3.2481 (−1)	3.0141	9.0900 (7)

continued

Table V(b). ***(continued)***

S III

Transition	E_i (Ry)	E_f (Ry)	WL (Å)	g_i	g_f	f_{if}	S	a_{ji} (sec^{-1})
$b^3P^e \rightarrow v^3P^o$	3.4030 (−1)			9	9	1.3147 (−1)	1.0431 (1)	1.2229 (8)
	1.5783	1.9200	2666	5	5	9.9004 (−2)	4.3461	9.2850 (7)
	1.5783	1.9130	2722	5	3	3.2325 (−2)	1.4487	4.8478 (7)
	1.5746	1.9200	2638	3	5	5.5598 (−2)	1.4487	3.1966 (7)
	1.5746	1.9130	2693	3	3	3.2683 (−2)	8.6922 (−1)	3.0062 (7)
	1.5746	1.9116	2704	3	1	4.3397 (−2)	1.1590	1.1876 (8)
	1.5731	1.9130	2681	1	3	1.3131 (−1)	1.1590	4.0618 (7)
$b^3P^e \rightarrow x^3D^o$	3.0767 (−1)			9	15	7.3858 (−1)	6.4816 (1)	3.3694 (8)
	1.5783	1.8855	2966	5	7	6.1946 (−1)	3.0247 (1)	3.3540 (8)
	1.5783	1.8833	2987	5	5	1.0983 (−1)	5.4013	8.2062 (7)
	1.5783	1.8821	2999	5	3	7.2930 (−3)	3.6009 (−1)	9.0108 (6)
	1.5746	1.8833	2951	3	5	5.5579 (−1)	1.6204 (1)	2.5526 (8)
	1.5746	1.8821	2963	3	3	1.8454 (−1)	5.4013	1.4016 (8)
	1.5731	1.8821	2949	1	3	7.4178 (−1)	7.2017	1.8963 (8)
$z^3P^o \rightarrow a^3S^e$	6.8602 (−1)			9	3	2.5494 (−2)	1.0034	2.8912 (8)
	0.8998	1.5860	1328	5	3	2.5499 (−2)	5.5742 (−1)	1.6071 (8)
	0.9000	1.5860	1329	3	3	2.5492 (−2)	3.3445 (−1)	9.6353 (7)
	0.9001	1.5860	1329	1	3	2.5490 (−2)	1.1148 (−1)	3.2109 (7)
$z^3P^o \rightarrow b^3P^e$	6.7653 (−1)			9	9	8.7698 (−3)	3.5000 (−1)	3.2240 (7)
	0.8998	1.5783	1343	5	5	6.5961 (−3)	1.4583 (−1)	2.4388 (7)
	0.8998	1.5746	1351	5	3	2.1867 (−3)	4.8611 (−2)	1.3328 (7)
	0.9000	1.5783	1344	3	5	3.6636 (−3)	4.8611 (−2)	8.1229 (6)
	0.9000	1.5746	1351	3	3	2.1861 (−3)	2.9167 (−2)	7.9906 (6)
	0.9000	1.5731	1354	3	1	2.9084 (−3)	3.8889 (−2)	3.1750 (7)
	0.9001	1.5746	1351	1	3	8.7438 (−3)	3.8889 (−2)	1.0651 (7)
$z^3P^o \rightarrow a^3D^e$	6.5179 (−1)			9	15	4.3109 (−3)	1.7858 (−1)	8.8261 (6)
	0.8998	1.5551	1391	5	7	3.6404 (−3)	8.3335 (−2)	8.9678 (6)
	0.8998	1.5498	1402	5	5	6.4482 (−4)	1.4881 (−2)	2.1880 (6)
	0.8998	1.5471	1408	5	3	4.2809 (−5)	9.9209 (−4)	2.4009 (5)
	0.9000	1.5498	1402	3	5	3.2232 (−3)	4.4644 (−2)	6.5585 (6)
	0.9000	1.5471	1408	3	3	1.0699 (−3)	1.4881 (−2)	3.5984 (6)
	0.9001	1.5471	1408	1	3	4.2793 (−3)	1.9842 (−2)	4.7965 (6)
$y^3P^o \rightarrow a^3S^e$	2.8175 (−1)			9	3	7.1667 (−3)	6.8677 (−1)	1.3709 (7)
	1.3042	1.5860	3235	5	3	7.1679 (−3)	3.8154 (−1)	7.6201 (6)
	1.3042	1.5860	3234	3	3	7.1679 (−3)	2.2892 (−1)	4.5720 (6)
	1.3040	1.5860	3232	1	3	7.1730 (−3)	7.6308 (−2)	1.5273 (6)
$y^3P^o \rightarrow b^3P^e$	2.7226 (−1)			9	9	3.2359 (−1)	3.2091 (1)	1.9266 (8)
	1.3042	1.5783	3326	5	5	2.4434 (−1)	1.3371 (1)	1.4745 (8)
	1.3042	1.5746	3371	5	3	8.0346 (−2)	4.4571	7.8644 (7)
	1.3042	1.5783	3325	3	5	1.3574 (−1)	4.4571	4.9150 (7)
	1.3042	1.5746	3370	3	3	8.0346 (−2)	2.6742	4.7186 (7)
	1.3042	1.5731	3388	3	1	1.0653 (−1)	3.5656	1.8562 (8)
	1.3040	1.5746	3368	1	3	3.2162 (−1)	3.5656	6.3055 (7)
$y^3P^o \rightarrow a^3D^e$	2.4752 (−1)			9	15	2.6247 (−1)	2.8631 (1)	7.7495 (7)
	1.3042	1.5551	3633	5	7	2.2349 (−1)	1.3361 (1)	8.0717 (7)
	1.3042	1.5498	3711	5	5	3.9066 (−2)	2.3859	1.8927 (7)
	1.3042	1.5471	3753	5	3	2.5757 (−3)	1.5906 (−1)	2.0344 (6)
	1.3042	1.5498	3710	3	5	1.9533 (−1)	7.1578	5.6782 (7)
	1.3042	1.5471	3752	3	3	6.4394 (−2)	2.3859	3.0517 (7)
	1.3040	1.5471	3749	1	3	2.5779 (−1)	3.1812	4.0789 (7)
$x^3P^o \rightarrow a^3S^e$	2.4674 (−1)			9	3	1.6523 (−1)	1.8081 (1)	2.4241 (8)
	1.3409	1.5860	3719	5	3	1.6413 (−1)	1.0045 (1)	1.3200 (8)
	1.3372	1.5860	3663	3	3	1.6661 (−1)	6.0269	8.2839 (7)
	1.3368	1.5860	3658	1	3	1.6688 (−1)	2.0090	2.7747 (7)
$x^3P^o \rightarrow b^3P^e$	2.3725 (−1)			9	9	7.3304 (−2)	8.3423	3.3141 (7)
	1.3409	1.5783	3839	5	5	5.5013 (−2)	3.4760	2.4904 (7)
	1.3409	1.5746	3900	5	3	1.8052 (−2)	1.1587	1.3199 (7)
	1.3372	1.5783	3780	3	5	3.1039 (−2)	1.1587	8.6955 (6)

Table V(b). ***(continued)***

S III

Transition	E_i (Ry)	E_f (Ry)	WL (Å)	g_i	g_f	f_{if}	S	a_{ji} (sec^{-1})
	1.3372	1.5746	3839	3	3	1.8338 (−2)	6.9520 (−1)	8.3012 (6)
	1.3372	1.5731	3862	3	1	2.4296 (−2)	9.2693 (−1)	3.2580 (7)
	1.3368	1.5746	3833	1	3	7.3474 (−2)	9.2693 (−1)	1.1142 (7)
$x^3P^o \rightarrow a^3D^e$	2.1251 (−1)			9	15	2.7295 (−1)	3.4679 (1)	5.9405 (7)
	1.3409	1.5551	4255	5	7	2.3110 (−1)	1.6183 (1)	6.0834 (7)
	1.3409	1.5498	4363	5	5	4.0247 (−2)	2.8899	1.4107 (7)
	1.3409	1.5471	4420	5	3	2.6484 (−3)	1.9266 (−1)	1.5075 (6)
	1.3372	1.5498	4286	3	5	2.0480 (−1)	8.6697	4.4611 (7)
	1.3372	1.5471	4341	3	3	6.7399 (−2)	2.8899	2.3851 (7)
	1.3368	1.5471	4334	1	3	2.7011 (−1)	3.8532	3.1984 (7)
$a^3D^e \rightarrow w^3P^o$	3.4371 (−1)			15	9	8.2838 (−4)	1.0845 (−1)	1.3101 (6)
	1.5551	1.8945	2685	7	5	8.1799 (−4)	5.0612 (−2)	1.0596 (6)
	1.5498	1.8945	2644	5	5	2.0769 (−4)	9.0379 (−3)	1.9821 (5)
	1.5471	1.8945	2623	3	5	2.3257 (−5)	6.0252 (−4)	1.3527 (4)
	1.5498	1.8964	2629	5	3	6.2650 (−4)	2.7114 (−2)	1.0075 (6)
	1.5471	1.8964	2609	3	3	3.5077 (−4)	9.0379 (−3)	3.4376 (5)
	1.5471	1.8974	2601	3	1	4.6903 (−4)	1.2050 (−2)	1.3869 (6)
$a^3D^e \rightarrow v^3P^o$	3.6504 (−1)			15	9	1.8411 (−1)	2.2695 (1)	3.2842 (8)
	1.5551	1.9200	2497	7	5	1.8403 (−1)	1.0591 (1)	2.7556 (8)
	1.5498	1.9200	2461	5	5	4.6677 (−2)	1.8913	5.1382 (7)
	1.5471	1.9200	2443	3	5	5.2241 (−3)	1.2609 (−1)	3.5010 (6)
	1.5498	1.9130	2509	5	3	1.3738 (−1)	5.6738	2.4261 (8)
	1.5471	1.9130	2490	3	3	7.6891 (−2)	1.8913	8.2687 (7)
	1.5471	1.9116	2500	3	1	1.0213 (−1)	2.5217	3.2697 (8)
$a^3D^e \rightarrow x^3D^o$	3.3241 (−1)			15	15	1.5730 (−1)	2.1295 (1)	1.3961 (8)
	1.5551	1.8855	2758	7	7	1.3893 (−1)	8.8304	1.2182 (8)
	1.5551	1.8833	2776	7	5	1.7306 (−2)	1.1073	2.0963 (7)
	1.5498	1.8855	2714	5	7	2.4782 (−2)	1.1073	1.6023 (7)
	1.5498	1.8833	2732	5	5	1.0984 (−1)	4.9405	9.8130 (7)
	1.5498	1.8821	2742	5	3	2.3588 (−2)	1.0648	3.4869 (7)
	1.5471	1.8833	2710	3	5	3.9775 (−2)	1.0648	2.1667 (7)
	1.5471	1.8821	2720	3	3	1.1890 (−1)	3.1943	1.0718 (8)
$a^3D^e \rightarrow y^3F^o$	3.1789 (−1)			15	21	9.0781 (−1)	1.2851 (2)	5.2634 (8)
	1.5551	1.8732	2864	7	9	8.3425 (−1)	5.5075 (1)	5.2737 (8)
	1.5551	1.8688	2905	7	7	7.1301 (−2)	4.7731	5.6359 (7)
	1.5551	1.8643	2947	7	5	1.9822 (−3)	1.3463 (−1)	2.1311 (6)
	1.5498	1.8688	2857	5	7	8.0947 (−1)	3.8063 (1)	4.7259 (8)
	1.5498	1.8643	2898	5	5	1.0008 (−1)	4.7731	7.9508 (7)
	1.5471	1.8643	2873	3	5	9.0583 (−1)	2.5701 (1)	4.3924 (8)
$z^3D^o \rightarrow b^3P^e$	8.1038 (−1)			15	9	1.8926 (−2)	1.0510	1.6639 (8)
	0.7664	1.5783	1122	7	5	1.8962 (−2)	4.9045 (−1)	1.4057 (8)
	0.7659	1.5783	1122	5	5	4.7433 (−3)	8.7580 (−2)	2.5145 (7)
	0.7656	1.5783	1121	3	5	5.2721 (−4)	5.8387 (−3)	1.6780 (6)
	0.7659	1.5746	1127	5	3	1.4165 (−2)	2.6274 (−1)	1.2402 (8)
	0.7656	1.5746	1127	3	3	7.8721 (−3)	8.7580 (−2)	4.1379 (7)
	0.7656	1.5731	1129	3	1	1.0477 (−2)	1.1677 (−1)	1.6460 (8)
$z^3D^o \rightarrow a^3D^e$	7.8565 (−1)			15	15	8.2806 (−3)	4.7430 (−1)	4.1054 (7)
	0.7664	1.5551	1155	7	7	7.3868 (−3)	1.9667 (−1)	3.6911 (7)
	0.7664	1.5498	1163	7	5	9.2010 (−4)	2.4663 (−2)	6.3504 (6)
	0.7659	1.5551	1155	5	7	1.2976 (−3)	2.4663 (−2)	4.6369 (6)
	0.7659	1.5498	1162	5	5	5.7505 (−3)	1.1004 (−1)	2.8383 (7)
	0.7659	1.5471	1167	5	3	1.2351 (−3)	2.3715 (−2)	1.0090 (7)
	0.7656	1.5498	1162	3	5	2.0662 (−3)	2.3715 (−2)	6.1232 (6)
	0.7656	1.5471	1166	3	3	6.1774 (−3)	7.1144 (−2)	3.0301 (7)
$y^3D^o \rightarrow b^3P^e$	2.3061 (−1)			15	9	7.2797 (−2)	1.4205 (1)	5.1827 (7)
	1.3464	1.5783	3930	7	5	7.3205 (−2)	6.6291	4.4269 (7)
	1.3459	1.5783	3921	5	5	1.8341 (−2)	1.1838	7.9565 (6)
	1.3446	1.5783	3900	3	5	2.0492 (−3)	7.8918 (−2)	5.3938 (5)

continued

Table V(b). ***(continued)***

	S III							
Transition	E_i (Ry)	E_f (Ry)	WL (Å)	g_i	g_f	f_{ij}	S	a_{ji} (sec^{-1})
	1.3459	1.5746	3985	5	3	5.4146 (−2)	3.5513	3.7912 (7)
	1.3446	1.5746	3963	3	3	3.0252 (−2)	1.1838	1.2854 (7)
	1.3446	1.5731	3987	3	1	4.0073 (−2)	1.5784	5.0417 (7)
$y^3D^o \rightarrow a^3D^e$	2.0587 (−1)			15	15	2.5007 (−2)	5.4660	8.5129 (6)
	1.3464	1.5551	4366	7	7	2.2525 (−3)	2.2666	7.8805 (6)
	1.3464	1.5498	4480	7	5	2.7530 (−3)	2.8423 (−1)	1.2808 (6)
	1.3459	1.5551	4356	5	7	3.9641 (−3)	2.8423 (−1)	9.9535 (5)
	1.3459	1.5498	4469	5	5	1.7238 (−2)	1.2681	5.7565 (6)
	1.3459	1.5471	4529	5	3	3.6659 (−3)	2.7330 (−1)	1.9866 (6)
	1.3446	1.5498	4441	3	5	6.2313 (−3)	2.7330 (−1)	1.2645 (6)
	1.3446	1.5471	4500	3	3	1.8448 (−2)	8.1990 (−1)	6.0762 (6)
$z^3F^o \rightarrow a^3D^e$	4.3536 (−1)			21	15	1.4146 (−1)	2.0470 (1)	3.0151 (8)
	1.1190	1.5551	2090	9	7	1.4170 (−1)	8.7728	2.7830 (8)
	1.1154	1.5551	2073	7	7	1.5919 (−2)	7.6031 (−1)	2.4722 (7)
	1.1128	1.5551	2060	5	7	6.3233 (−4)	2.1445 (−2)	7.0972 (5)
	1.1154	1.5498	2098	7	5	1.2542 (−1)	6.0630	2.6614 (8)
	1.1128	1.5498	2085	5	5	2.2150 (−2)	7.6031 (−1)	3.3977 (7)
	1.1128	1.5471	2099	5	3	1.1853 (−1)	4.0940	2.9930 (8)

Table V(c). ***f- and A-values for Ar V***

Ar V								
Transition	E_i (Ry)	E_f (Ry)	WL (Å)	g_i	g_f	f_{ij}	S	a_{ji} (sec^{-1})
$a^1S^e \rightarrow z^1P^o$	0.3455	1.7802	635	1	3	1.1346 (−1)	2.3724 (−1)	6.2528 (8)
$a^1S^e \rightarrow y^1P^o$	0.3455	2.2976	467	1	3	2.2398	3.4422	2.2853 (10)
$a^1S^e \rightarrow x^1P^o$	0.3455	2.7456	380	1	3	1.5454 (−1)	1.9316 (−1)	2.3835 (9)
$a^1D^e \rightarrow z^1P^o$	0.1485	1.7802	558	5	3	2.7960 (−1)	2.5704	9.9653 (9)
$a^1D^e \rightarrow y^1P^o$	0.1485	2.2976	424	5	3	3.3710 (−3)	2.3529 (−2)	2.0842 (8)
$a^1D^e \rightarrow x^1P^o$	0.1485	2.7456	351	5	3	1.4288 (−1)	8.2522 (−1)	1.2901 (10)
$a^1D^e \rightarrow z^1D^o$	0.1485	1.4053	725	5	5	6.5355 (−2)	7.8003 (−1)	8.2914 (8)
$a^1D^e \rightarrow z^1F^o$	0.1485	2.2354	437	5	7	1.1903	8.5557	2.9741 (10)
$a^3P^e \rightarrow z^3S^o$	1.7328			9	3	2.9778 (−1)	4.6399	2.1546 (10)
	0.0185	1.7454	528	5	3	2.9676 (−1)	2.5777	1.1848 (10)
	0.0070	1.7454	524	3	3	2.9874 (−1)	1.5466	7.2520 (9)
	0.0000	1.7454	522	1	3	2.9994 (−1)	5.1554 (−1)	2.4465 (9)
$a^3P^e \rightarrow z^3P^o$	1.2793			9	9	6.0916 (−2)	1.2857	8.0077 (8)
	0.0185	1.2918	716	5	5	4.5473 (−2)	5.3569 (−1)	5.9219 (8)
	0.0185	1.2919	716	5	3	1.5159 (−2)	1.7856 (−1)	3.2907 (8)
	0.0070	1.2918	709	3	5	2.5492 (−2)	1.7856 (−1)	2.0281 (8)
	0.0070	1.2919	709	3	3	1.5296 (−2)	1.0714 (−1)	2.0285 (8)
	0.0070	1.2919	709	3	1	2.0395 (−2)	1.4285 (−1)	8.1142 (8)
	0.0000	1.2919	705	1	3	6.1516 (−2)	1.4285 (−1)	2.7489 (8)
$a^3P^e \rightarrow y^3P^o$	1.9734			9	9	5.7123 (−1)	7.8157	1.7867 (10)
	0.0185	1.9827	464	5	5	4.2643 (−1)	3.2565	1.3215 (10)
	0.0185	1.9892	462	5	3	1.4262 (−1)	1.0855	7.4147 (9)
	0.0070	1.9827	461	3	5	2.3830 (−1)	1.0855	4.4830 (9)
	0.0070	1.9892	460	3	3	1.4345 (−1)	6.5131 (−1)	4.5274 (9)
	0.0070	1.9924	459	3	1	1.9157 (−1)	8.6841 (−1)	1.8197 (10)
	0.0000	1.9892	458	1	3	5.7581 (−1)	8.6841 (−1)	6.1003 (9)
$a^3P^e \rightarrow x^3P^o$	2.6948			9	9	1.4379 (−1)	1.4406	8.3872 (9)
	0.0185	2.7146	338	5	5	1.0789 (−1)	6.0025 (−1)	6.2993 (9)
	0.0185	2.6996	340	5	3	3.5763 (−2)	2.0008 (−1)	3.4415 (9)
	0.0070	2.7146	337	3	5	6.0195 (−2)	2.0008 (−1)	2.1268 (9)
	0.0070	2.6996	338	3	3	3.5917 (−2)	1.2005 (−1)	2.0917 (9)
	0.0070	2.6950	339	3	1	4.7808 (−2)	1.6007 (−1)	8.3239 (9)
	0.0000	2.6996	338	1	3	1.4404 (−1)	1.6007 (−1)	2.8106 (9)
$a^3P^e \rightarrow z^3D^o$	1.0967			9	15	4.2832 (−2)	1.0545	2.4827 (8)
	0.0185	1.1100	835	5	7	3.5808 (−2)	4.9210 (−1)	2.4475 (8)
	0.0185	1.1088	836	5	5	6.3873 (−3)	8.7874 (−2)	6.0990 (7)
	0.0185	1.1084	836	5	3	4.2567 (−4)	5.8583 (−3)	6.7692 (6)
	0.0070	1.1088	827	3	5	3.2274 (−2)	2.6362 (−1)	1.8884 (8)
	0.0070	1.1084	827	3	3	1.0754 (−2)	8.7874 (−2)	1.0479 (8)
	0.0000	1.1084	822	1	3	4.3289 (−2)	1.1717 (−1)	1.4239 (8)
$a^3P^e \rightarrow y^3D^o$	2.0336			9	15	1.3865	1.8408 (1)	2.7634 (10)
	0.0185	2.0478	449	5	7	1.1622	8.5905	2.7459 (10)
	0.0185	2.0458	449	5	5	2.0733 (−1)	1.5340	6.8444 (9)
	0.0185	2.0432	450	5	3	1.3804 (−2)	1.0227 (−1)	7.5757 (8)
	0.0070	2.0458	447	3	5	1.0425	4.6021	2.0886 (10)
	0.0070	2.0432	448	3	3	3.4707 (−1)	1.5340	1.1559 (10)
	0.0000	2.0432	446	1	3	1.3930	2.0454	1.5570 (10)

Table V(d). ***f- and A-values for Ca VII***

Ca VII								
Transition	E_i (Ry)	E_f (Ry)	WL (Å)	g_i	g_f	f_{if}	S	a_{ji} (sec^{-1})
$a^1S^e \rightarrow z^1P^o$	0.4464	2.3009	491	1	3	1.7418 (−1)	2.8176 (−1)	1.6039 (9)
$a^1S^e \rightarrow y^1P^o$	0.4464	3.0391	351	1	3	1.7788	2.0582	3.2016 (10)
$a^1S^e \rightarrow x^1P^o$	0.4464	4.5443	222	1	3	1.1364 (−1)	8.3191 (−2)	5.1094 (9)
$a^1D^e \rightarrow z^1P^o$	0.1992	2.3009	434	5	3	2.4739 (−1)	1.7657	1.4628 (10)
$a^1D^e \rightarrow y^1P^o$	0.1992	3.0391	321	5	3	5.9080 (−4)	3.1206 (−3)	6.3785 (7)
$a^1D^e \rightarrow x^1P^o$	0.1992	4.5443	210	5	3	1.3939 (−1)	4.8121 (−1)	3.5231 (10)
$a^1D^e \rightarrow z^1D^o$	0.1992	1.8555	550	5	5	8.8939 (−2)	8.0548 (−1)	1.9597 (9)
$a^1D^e \rightarrow z^1F^o$	0.1992	2.9606	330	5	7	9.5905 (−1)	5.2097	4.1956 (10)
$a^3P^e \rightarrow z^3S^o$	2.2092			9	3	2.6389 (−1)	3.2251	3.1037 (10)
	0.0371	2.2348	415	5	3	2.6251 (−1)	1.7917	1.6973 (10)
	0.0148	2.2348	410	3	3	2.6518 (−1)	1.0750	1.0497 (10)
	0.0000	2.2348	408	1	3	2.6694 (−1)	3.5835 (−1)	3.5695 (9)
$a^3P^e \rightarrow z^3P^o$	1.6639			9	9	6.8054 (−2)	1.1043	1.5134 (9)
	0.0371	1.6896	551	5	5	5.0690 (−2)	4.6012 (−1)	1.1118 (9)
	0.0371	1.6894	552	5	3	1.6895 (−2)	1.5337 (−1)	6.1746 (8)
	0.0148	1.6896	544	3	5	2.8541 (−2)	1.5337 (−1)	3.8581 (8)
	0.0148	1.6894	544	3	3	1.7123 (−2)	9.2024 (−2)	3.8568 (8)
	0.0148	1.6891	544	3	1	2.2826 (−2)	1.2270 (−1)	1.5419 (9)
	0.0000	1.6894	539	1	3	6.9096 (−2)	1.2270 (−1)	5.2800 (8)
$a^3P^e \rightarrow y^3P^o$	2.5914			9	9	4.5392 (−1)	4.7294	2.4485 (10)
	0.0371	2.6083	354	5	5	3.3779 (−1)	1.9706	1.7937 (10)
	0.0371	2.6259	352	5	3	1.1337 (−1)	6.5687 (−1)	1.0171 (10)
	0.0148	2.6083	351	3	5	1.8929 (−1)	6.5687 (−1)	6.1359 (9)
	0.0148	2.6259	349	3	3	1.1434 (−1)	3.9412 (−1)	6.2617 (9)
	0.0148	2.6336	348	3	1	1.5291 (−1)	5.2549 (−1)	2.5269 (10)
	0.0000	2.6259	347	1	3	4.5996 (−1)	5.2549 (−1)	8.4917 (9)
$a^3P^e \rightarrow x^3P^o$	4.4641			9	9	1.4796 (−1)	8.9489 (−1)	2.3683 (10)
	0.0371	4.5040	204	5	5	1.1104 (−1)	3.7287 (−1)	1.7796 (10)
	0.0371	4.4736	205	5	3	3.6761 (−2)	1.2429 (−1)	9.6862 (9)
	0.0148	4.5040	203	3	5	6.1996 (−2)	1.2429 (−1)	6.0213 (9)
	0.0148	4.4736	204	3	3	3.6946 (−2)	7.4574 (−2)	5.8998 (9)
	0.0148	4.4657	205	3	1	4.9174 (−2)	9.9432 (−2)	2.3474 (10)
	0.0000	4.4736	204	1	3	1.4827 (−1)	9.9432 (−2)	7.9450 (9)
$a^3P^e \rightarrow z^3D^o$	1.4357			9	15	5.1209 (−2)	9.6305 (−1)	5.0869 (8)
	0.0371	1.4628	639	5	7	4.2716 (−2)	4.4942 (−1)	4.9814 (8)
	0.0371	1.4600	640	5	5	7.6129 (−3)	8.0254 (−2)	1.2380 (8)
	0.0371	1.4595	641	5	3	5.0735 (−4)	5.3503 (−3)	1.3741 (7)
	0.0148	1.4600	631	3	5	3.8661 (−2)	2.4076 (−1)	3.8914 (8)
	0.0148	1.4595	631	3	3	1.2882 (−2)	8.0254 (−2)	2.1597 (8)
	0.0000	1.4595	624	1	3	5.2058 (−2)	1.0701 (−1)	2.9690 (8)
$a^3P^e \rightarrow y^3D^o$	2.6701			9	15	1.1191	1.1316 (1)	3.8450 (10)
	0.0371	2.6986	342	5	7	9.3697 (−1)	5.2807	3.8079 (10)
	0.0371	2.6953	343	5	5	1.6711 (−1)	9.4298 (−1)	9.4845 (9)
	0.0371	2.6895	344	5	3	1.1116 (−2)	6.2866 (−2)	1.0469 (9)
	0.0148	2.6953	340	3	5	8.4255 (−1)	2.8290	2.9175 (10)
	0.0148	2.6895	341	3	3	2.8024 (−1)	9.4298 (−1)	1.6104 (10)
	0.0000	2.6895	339	1	3	1.1272	1.2573	2.1830 (10)

References

1. Seaton, M. J., J. Phys. **B20,** 6363 (1987); Berrington, K. A., Burke, P. G., Butler, K., Seaton, M. J., Storey, P. J., Taylor, K. T. and Yu, Y., J. Phys. **B20,** 6379 (1987).
2. Nahar, S. N. and Pradhan, A. K., J. Phys. **B26,** 1109 (1993).
3. Allen, C. W., "Astrophysical Quantities" (3rd Edition) (Athlone Press, London 1976).
4. O'Brian, T. R. and Lawler, J. E., Phys. Rev. **A44,** 7134 (1991).
5. Becker U., Kerkhoff, H., Kwiatkowski, M., Schmidt, M., Teppner, U. and Zimmermann, P., Phys. Lett. **76A,** 125 (1980).
6. Berry, H. G., Schectman, R. M., Martinsen, I., Bickel, W. S. and Bashkin, S. J., J. Opt. Soc. Am. **60,** 335 (1970).
7. Livingston, A. E., Dumont, P. D., Baudinet-Robinet, Y., Garnir, H. P., Biemont, E. and Grevesse, N., in: "Beam-Foil Spectroscopy" (Edited by I. A. Sellin and D. J. Pegg) (Plenum, New York 1976), p. 339.
8. Irwin, D. J. G., Livingston, A. E. and Kernahan, J. A., Nucl. Inst. Meth. **110,** 111(1973).
9. Ryan, L. J., Rayburn, L. A. and Cunningham, A. J., J. Quant. Spectro-sc. Radiat. Transfer **42,** 295 (1989).
10. Martin, W. C. and Zalubas, R., J. Phys. Chem. Ref. Data **12,** 323 (1983); Moore, C. E., "Atomic Energy Levels", Natl. Bur. Stand. (U.S.) Circ. No. 467 (U.S. GPO Washington, D.C. 1949); Johansson, L., Magnusson, C. E., Joelsson, I., Zetterberg, P. O., Physica Scripta (1992, in press), their relative energies have been scaled with respect to the ionization energy; Martin, W. C, Zalubus, R., Musgrove, A., J. Phys. Chem. Ref. Data 19, 821 (1990); Kelly, R. L., unpublished compilation, closely corresponds to: Kelly, R. L., J. Phys. Chem. Ref. Data 16, Suppl. 2 (1987) (private communication, NIST); Sugar, J. and Corliss, C, J. Phys. Chem. Ref. Data 14, Suppl. 2 (1985).
11. Mendoza, C. and Zeippen, C. J., J. Phys. **B21,** 259 (1988).
12. Ho, Y. K. and Henry, R. J, Physica Scripta 35, 831 (1987).
13. Biemont, E., J. Opt. Soc. Am. **B3,** 163 (1986).
14. Bergstrom, H., Fans, G. W., Hallstadius, H., Lundberg, H. and Persson, A., Z. Phys. **D13,** 29 (1989).
15. Dumont, P. D., Garnir, H. P. and Baudinet-Robinet, Y., J. Opt. Soc. Am. 68, 825 (1978).
16. Irwin, D. J. G. and Livingston, A. E., Can. J. Phys. 54, 805 (1976).
17. Livingston, A. E., Pinnington, E. H., Irwin, D. J. G., Kernahan, J. A. and Brooks, R. L., J. Opt. Soc. Am. 71, 442 (1981).